

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

STUDENTS FOR FAIR ADMISSIONS, *
INC., *

Plaintiff, *

vs. *

UNIVERSITY OF NORTH CAROLINA, *
et al., *

Defendants. *

Case No. 1:14CV954

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EXPEDITED TRANSCRIPT OF TRIAL
BEFORE THE HONORABLE LORETTA C. BIGGS
UNITED STATES DISTRICT JUDGE

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I N D E X**PLAINTIFF'S WITNESSES:****PAGE****PETER ARCIDIACONO**

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P R O C E E D I N G S

THE COURT: Good morning.

(Simultaneous response from counsel.)

THE COURT: I have received Plaintiff's motion for clarification or reconsideration of one of my rulings on yesterday. I will allow the other parties to respond to that. I will allow you time to respond to that. I will allow your witness to proffer the testimony that he would give in the event the Court does reconsider its ruling.

Is there anything further we need to address before we move forward?

MR. FITZGERALD: Your Honor --

MR. MCCARTHY: Not from our perspective.

MR. FITZGERALD: Your Honor, we appreciate the opportunity to respond, but I'm prepared to respond right now, if you would prefer.

THE COURT: I don't want to take the time to do that right now.

MR. FITZGERALD: Okay.

THE COURT: I would rather have something in writing so that I can digest it. So I'm going to give you an opportunity to -- unless you are saying that you don't want an opportunity to do me a written response.

MR. FITZGERALD: I would like that opportunity. Thank you.

1 **THE COURT:** All right. I will give you that
2 opportunity.

3 **MR. FITZGERALD:** Thank you.

4 **THE COURT:** All right. So if we could call the doctor
5 back to the stand.

6 Now, what we will do is I want you to proceed with the
7 testimony for trial that has not been excluded, and then at the
8 end of that, once you are done, I will allow him to proffer
9 whatever testimony you wish for him to proffer for this Court
10 to consider as it relates to that issue.

11 **MR. MCCARTHY:** Okay, Your Honor. Thank you.

12 **THE COURT:** All right.

13 (The witness entered the courtroom.)

14 **THE COURT:** I am going to ask that he be sworn again.

15 Sir, if you would come to the witness stand.

16 You may resume questioning at this time.

17 **MR. MCCARTHY:** Thank you, Your Honor.

18 **THE COURT:** Uh-huh.

19 **PETER ARCIDIACONO, PLAINTIFF'S WITNESS, SWORN**

20 **CONTINUED DIRECT EXAMINATION**

21 **BY MR. MCCARTHY:**

22 Q. Good morning, Professor Arcidiacono.

23 A. Good morning.

24 Q. Yesterday when we broke for the day, you had just completed
25 discussing your transformational analysis, correct?

1 A. Correct.

2 Q. Let's turn to the second method of calculating the effect
3 of racial preferences that you identified yesterday.

4 Did you prepare a slide showing your methodology for your
5 average marginal effect analysis?

6 A. I did.

7 Q. What do you illustrate in this slide?

8 A. So this basically takes all the components we've been
9 talking about before, all your characteristics -- race, your
10 scores on UNC's ratings, test scores -- and combines that into
11 the admissions index that we've been talking about before, and
12 that's going to give you a probability of admission.

13 Probability of admission with race is actually just the status
14 quo. That's going to sort of match the averages in the data.

15 And then we're going to turn off the effects of race and
16 calculate your probability of admission without race, and then
17 we're going to look at that. The difference between those two
18 gives you the marginal effect of race. So then we can do
19 that -- average that across, say, all African Americans, and
20 that would give you the average marginal effect.

21 Q. Thank you.

22 What is it that the average marginal effect of racial
23 preferences have shown us?

24 A. They're showing us how admissions probabilities would
25 change for all African Americans who applied.

1 Q. Is the average marginal effect a metric that economists
2 commonly use to quantify the effect of a variable on an
3 outcome?

4 A. So it's certainly common in the case of models like this,
5 where you're doing a logit model where the outcome is discrete.
6 It's probably the standard way of doing it.

7 Q. And did you prepare a slide showing the results of this
8 analysis?

9 A. I did.

10 Q. What does your slide show?

11 A. So this shows the average marginal effects. It also shows
12 your admission probability with racial preferences. That's the
13 status quo, what your admissions probability without racial
14 preferences would be. That's turning off the effects of race.
15 And then the difference between the two is what is the marginal
16 effect of race.

17 Q. Let's look at the first panel of this slide. That's
18 in-state applicants, correct?

19 A. Correct.

20 Q. And what does that -- what does the first column show
21 there?

22 A. That's the status quo, so with racial preferences in place.
23 So that 30.5 percent, that was the admit rate that we saw for
24 African Americans, and the 41 percent was the admit rate for
25 Hispanics in state.

1 Q. And then if we move over one column, what did the data show
2 on the second column?

3 A. Well, that shows how the average admit probability would
4 change once racial preferences are removed. So now the number
5 falls for African Americans to 17.8 percent and for Hispanics
6 to 31.2 percent.

7 Q. And then if we move to the third column, what did the data
8 show there?

9 A. This is the marginal effect of race, and that's just the
10 difference between the two. This is how much race is
11 explaining of admissions probabilities.

12 Q. Let's take a look at the second panel of the slide. This
13 is now out-of-state applicants, correct?

14 A. That's correct.

15 Q. And what do the data in the first column show there?

16 A. Well, this is the status quo because now we're in an
17 environment with racial preferences. So this is just matching
18 the admit rate we see in the data. So my model exactly matches
19 that admit rate for African Americans and for Hispanics. So
20 that's 17.1 percent. For Hispanics, it's 20.3 percent.

21 Q. And then when we move over one column, what did the data
22 show there?

23 A. Well, this shows what the admit probabilities would be
24 without racial preferences, and you can see that it's very
25 stark. So for African Americans, it falls to 1.5 percent; and

1 for Hispanics, it falls to 6 percent.

2 Q. If we move over once more again to the third column, what
3 did the data there reveal?

4 A. That's just the difference between the first two columns.
5 So that's the 17.1 minus the 1.5, and that's how you get the
6 15.6.

7 Q. Now, does it make a difference here in the out of state --
8 with regard to out-of-state applicants that the base number is
9 so low there?

10 A. Yes. So if you look at that average marginal effect of
11 race, it's a little bit higher out of state than in state, but
12 it explains virtually, you know, like over 90 percent of
13 out-of-state admissions where it explains a much smaller share
14 of in-state admissions.

15 Q. Did you prepare a slide illustrating this effect?

16 A. I did.

17 Q. So can you tell us what you show in this slide?

18 A. So this is a marginal effect of race/ethnicity on the
19 probability of admission just looking at in-state applicants.

20 Q. And starting on the left, the in-state African American
21 applicants, what does the bar chart show?

22 A. So the second column just illustrates the 30.5 percent.
23 That's the status quo, the probability of -- average
24 probability of admission for African Americans in the in-state
25 example. The first bar shows what would happen if we took

1 racial preferences away. Now the probability is 17.8 percent,
2 and then the 12.7 percent number is the difference between the
3 30.5 and the 17.8. And that roughly accounts for 41.7 percent
4 of in-state African American admissions.

5 Q. Let's move over, then, to the bar chart to the right for
6 Hispanic applicants. And, again, this is in state, correct?

7 A. That's correct.

8 Q. What does the bar chart show there?

9 A. So with racial preferences, that's the status quo,
10 41 percent admit rate. The bar for Hispanics with no racial
11 preferences -- that's where we take away the bump the Hispanics
12 receive -- lowers the admissions probability to 31 percent.
13 The difference is 9.7 percent, and that accounts for roughly
14 23.8 percent of Hispanic admits.

15 Q. Did you prepare a slide showing similar analysis for
16 out-of-state applicants?

17 A. I did.

18 Q. Let's move on to that.

19 **MR. MCCARTHY:** If you could go to 39. This is 39?
20 Sorry. Yep. Thanks. Sorry for the confusion.

21 Q. (By Mr. McCarthy) What does the slide show for
22 out-of-state African American applicants?

23 A. So it shows a marginal effect of race on the probability of
24 admissions. It's basically the same slide that we had for in
25 state, now for out of state.

1 So if we look for African Americans in the first panel --
2 first panel, second column, the 17.1 percent corresponds to the
3 actual admit rate for African Americans out of state, and
4 that's an environment where racial preferences are in place.
5 The first column without racial preferences turns off those
6 racial bumps, and now the average admit rate would be
7 1.5 percent. So that accounts -- the marginal effect of race
8 is then the difference between those two, 15.6 percent, and
9 that accounts for over 90 percent of African American admits.

10 Q. If we move over to the right, the bar chart for Hispanic
11 applicants, what does that show?

12 A. Same thing for Hispanics. We see that the status quo is
13 20.3. If we take away racial preferences, you're down to
14 6 percent. The difference between the two is 14.2 percent. So
15 it's accounting for 70 percent.

16 Q. What then does this analysis tell you about UNC's racial
17 preferences?

18 A. That the racial preferences are extraordinarily high,
19 especially for out-of-state applicants.

20 Q. Did you do a similar average marginal effect analysis with
21 Professor Hoxby's preferred model?

22 A. I did.

23 Q. And did you prepare a slide showing that analysis?

24 A. I did.

25 Q. What's depicted in this slide?

1 A. This is the average marginal effect of racial preferences
2 for Professor Hoxby's Additive Model 9. She has two different
3 versions. This is the one that she pays the most attention to.

4 Q. And before we talk about the data, I should note here that
5 there are not separate analyses for in-state and out-of-state
6 applicants, correct?

7 A. That's correct. She's working with a slightly broader data
8 set because she's including some of the people that I cut from
9 my analysis.

10 Q. Does that miss out on some of the full picture of UNC's
11 racial preferences?

12 A. Well, yes, because the out-of-state preferences work so
13 differently from the in-state preferences.

14 Q. Let's look at the slide. What did the data show in the
15 first column?

16 A. The first column show the actual admit rate for out of
17 state and in state combined. So this is 24.3 percent for
18 African Americans, 27.9 percent for Hispanics.

19 I should also say one thing more about Hoxby's -- Professor
20 Hoxby's preferred model here. It doesn't have UNC's ratings in
21 the model. So, in my view, this is going to be underestimates
22 of how largely effective racial preferences are.

23 Q. Thank you for the clarification.

24 Let's move over to the second column. Can you tell us what
25 the data show there?

1 A. The second column shows that, according to Professor
2 Hoxby's model, if we turned off the effects of racial
3 preferences, what would the average admit probability be for
4 African Americans and Hispanics. And so for African Americans,
5 it falls to 11.7 percent; and for Hispanics, it's 16.6 percent.

6 Q. And moving over to the third column, what do the data show
7 there?

8 A. It's the difference between those two columns. So 24.3
9 minus 11.7 gives you the average marginal effect, which is
10 going to be 12.6 percent for African Americans and 11.2 percent
11 for Hispanics.

12 Q. What is the takeaway from your average marginal effect
13 analysis on Professor Hoxby's preferred model?

14 A. That even in Professor Hoxby's preferred model the racial
15 preferences are quite large.

16 Q. So now we've gone through your second mode of analysis in
17 terms of quantifying the effect of racial preferences, correct?

18 A. Correct.

19 Q. So we're going to turn to the third way you mentioned for
20 calculating the effect on racial preferences. Did you prepare
21 a slide showing your methodology for determining the effect of
22 racial preferences on admitted URMs?

23 A. I did.

24 Q. And can you explain that methodology for us?

25 A. I'll give it a shot. So the goal here is to determine the

1 probability that an underrepresented minority who is admitted
2 to UNC when racial preferences were in place would still have
3 been admitted if they had been treated as a white applicant.
4 And so the idea here is that you know something else about the
5 person if they've actually been admitted, if there's something
6 about their unobservables that push them over the edge.

7 Now, what's nice about the setup of these models is that
8 you can find the probability that you would be admitted without
9 preferences given that you were actually admitted with racial
10 preferences, and that turns out to follow right out of what's
11 called Bayes' Rule.

12 And what Bayes' Rule says is that effectively the
13 equation -- what's written on the left, that's a conditional
14 probability. This is conditional on being admitted with racial
15 preferences. What's the probability having been admitted
16 without racial preferences? And what Bayes' Rule allows you to
17 do is to break that up into a couple of pieces.

18 So what's up -- we look at that first equation there.
19 What's in the numerator is what's called the joint probability.
20 That's the probability that you would have been admitted both
21 with racial preferences and without racial preferences. And
22 the denominator, it's just the probability of being admitted
23 with preferences.

24 The nice thing here is that we actually know something
25 about that numerator because if you were admitted without

1 racial preferences, you surely would have been admitted with
2 racial preferences. If you were going to clear the threshold
3 without the bump, you'd clear it with the bump. And so that
4 means that the numerator just becomes the probability of being
5 admitted without racial preferences.

6 And that -- both the things in the numerator and
7 denominator are things that my model predicts. That's
8 effectively what went into some of that marginal effect
9 calculation: The probability of being admitted with racial
10 preferences, the probability of being admitted without racial
11 preferences.

12 So from here we can actually get for each individual
13 underrepresented minorities admitted what their probability of
14 being admitted would be if we took away those preferences.

15 Q. And so your starting point here, then, is it an applicant
16 who was actually admitted? Correct?

17 A. Yes. So their probability of admission is a hundred
18 percent, and now we're thinking about how that would change if
19 we took those preferences away. What's the -- what would
20 change if we took those racial preferences away. So we know
21 that they cleared the threshold for admission when racial
22 preferences were in place; and now if we take away that, what's
23 the probability that they would still clear that threshold.

24 Q. Did you prepare a slide showing the results of this
25 analysis?

1 A. I did.

2 Q. And at a high level, what did the data in this slide show?

3 A. So this shows the effect of racial preferences on admitted
4 underrepresented minorities. So when we look at that first
5 row, the first row shows the average admit probability for
6 previous admits. So you're starting with a hundred percent and
7 saying, "Okay. Well, according to the model, what would their
8 probability be if we took away those preferences?" Well, on
9 average now for African Americans, it would be 57.8 percent.

10 Q. So does that mean that they drop from a hundred percent
11 admission to 57.8 percent chance of admission?

12 A. On average, yes. We're averaging across all admitted
13 in-state African Americans there.

14 Q. Thank you for that clarification.

15 So then what is the number below that in the first column
16 where it says "Share with greater than 50 percent drop" on the
17 left and then 42.7 percent African Americans in state?

18 A. So what that's showing is how many -- we start off with a
19 hundred percent, so that was your for-sure admit. This is the
20 share of admitted African American in-state students who would
21 have seen their probability of admission fall from that hundred
22 percent to something less than 50 percent. So we have a
23 certain admit. Now what fraction would be more likely -- more
24 likely than not be rejected, and that's the 42.7 percent.

25 Q. If we move over to the second column, this is now Hispanic

1 applicants in state, correct?

2 A. Correct.

3 Q. What did the data reveal there?

4 A. So here racial preferences are not as strong for Hispanics
5 in state, so the numbers are higher. We're starting off again
6 with a hundred percent, and if we take away the racial
7 preferences, 75.8 percent would be the average admit
8 probability for those who were admitted when racial preferences
9 were in place.

10 Q. And then when we look down that column?

11 A. So this says almost 22 percent would have moved from a
12 certain admit to now without racial preferences more likely
13 than not being rejected.

14 Q. Let's look at the set for out-of-state applicants, the
15 third column there for African American applicants. What does
16 that show us?

17 A. Well, here's where the numbers are most stark, and what it
18 shows is that the average admit probability for previous
19 African Americans falls from a hundred percent when racial
20 preferences are in place to 8.7 percent. And then in the
21 second row, almost 95 percent would move from, you know,
22 certain admission to now more likely than not rejections.

23 Q. Let's move to the last column, the fourth one over there
24 for Hispanic out-of-state applicants. What does the data
25 reveal there?

1 A. So these are not as striking as what we saw for African
2 Americans, but still much larger than what we are seeing for
3 the in-state applicants. So for Hispanics, we're moving from a
4 hundred percent now to 29.2 percent. The average admit
5 probability for Hispanics that were admitted under racial
6 preferences, their average probability of being admitted if we
7 took those racial preferences away would be 29.2 percent. And
8 78.4 percent would move from people who were admitted with
9 racial preferences to now more likely than not would be
10 rejected.

11 Q. What, then, do you conclude from this analysis about UNC's
12 racial preferences?

13 A. Well, it's just another way of illustrating, you know, just
14 how large those racial preferences are, particularly when we're
15 looking out of state. I mean, it's hard to describe those out
16 of state, you know, from an economist's perspective, you know,
17 not a legal perspective as narrowly tailored.

18 **MR. FITZGERALD:** Objection to offering testimony about
19 the legal standards.

20 **MR. MCCARTHY:** That's fine, Your Honor.

21 **THE COURT:** Sustained.

22 Q. (By Mr. McCarthy) Let's look at your fourth mode of
23 analysis here, and that one is capacity constraints analysis.
24 So do you --

25 A. Yes, this one is a little different from the other three.

1 So for the first three analyses, we're really talking about
2 changing particular individuals' race or removing preferences
3 for particular individuals and seeing what would happen. When
4 we talk about capacity constraints analysis, if we actually
5 remove those racial preferences for one group, less students
6 would be admitted if we don't do anything else.

7 And so what the capacity constraints does is it adjusts so
8 that we're going to hold the number of people admitted fixed.
9 So now it's like, okay, if we really did get rid of racial
10 preferences, that's not going to lower the admit probabilities
11 quite as far as what we've seen here because a few more spots
12 are now going to open up at UNC once we take those preferences
13 away. So what the capacity constraints analysis does is it's
14 going to fill those seats.

15 Q. Did you prepare a slide to explain this methodology?

16 A. I did.

17 Q. And I think you've already explained some of this, but can
18 you make sure we understand your methodology?

19 A. Yes. So without racial preferences, you would see the
20 probabilities of African Americans and Hispanics go down, so
21 fewer spots are filled. So accordingly, we're going to want to
22 adjust each applicant's probability of admission up so that we
23 reach the same number of admitted applicants as what we see in
24 the data.

25 And this works out quite nicely with these models because

1 these models basically are threshold models. You have to clear
2 a threshold in order to be admitted. If more spots are opening
3 up, then the threshold we have to clear is just a little bit
4 lower, and so we can just adjust the threshold on this
5 admissions index, and that's going to give you the new
6 probabilities of being admitted. We adjust that threshold to
7 the exact point where the number of admits is going to line up
8 with what we see in the data.

9 Q. To match what actually happened in terms of the admissions
10 at UNC?

11 A. Exactly.

12 Q. Did you prepare a slide showing the results of this
13 analysis?

14 A. I did.

15 Q. And at a high level, what is shown in this slide?

16 A. So this is going to show the change in the number of
17 in-state students by race when we remove racial preferences.

18 Q. What's in the first row?

19 A. So the first row is really the status quo. So that's the
20 number of admits from our in-state data for whites, for Asian
21 Americans, African Americans, and Hispanics. So it shows
22 roughly 18,000 -- a little over 18,800 white admits.

23 Q. And then what do you show there in the second row?

24 A. In the second row, we've now adjusted to take into
25 account -- we turn off all the racial preferences, and then we

1 adjust the threshold for admission such that the number of
2 admits is the same as what we had in the status quo.

3 Now, if you added up all those numbers across those four
4 columns, you wouldn't get exactly the same number, and the
5 reason is we've got a couple of groups that are not on this
6 table because the numbers are just smaller. So, for example,
7 Native Americans and Pacific Islanders aren't on here and
8 neither are people who are missing their race. But those are
9 smaller groups. Just showing the four main categories.

10 Q. And then what's shown in the third row?

11 A. The third row is the difference between the two.

12 I should also mention this is over the entire six-year
13 period, okay. So if you were talking about a particular
14 admission cycle, you'd want to divide that by six.

15 So what it shows here is for whites the number of admits
16 increases to over -- by over a thousand. For Asian Americans,
17 it increases by almost 150. And that's balanced off mostly by
18 drops for African Americans of about 840 and Hispanics of 258.

19 Q. Did you do a similar analysis for out-of-state applicants?

20 A. I did.

21 Q. And did you prepare a slide showing the results there?

22 A. I did.

23 Q. What does this slide show?

24 A. Well, this slide shows the same thing that was on the
25 previous slide except now for out-of-state applicants. So the

1 first row is, again, the status quo, the number of admits by
2 race, our out-of-state example; and in the second row, we're
3 taking away the racial preferences and adjusting for capacity
4 constraints so that the total number of admits is exactly the
5 same. In the final row, we're looking at the difference
6 between the two, and that difference gives you, you know,
7 how -- over the six-year period how many admits of different
8 races there would be relative to the status quo.

9 Q. So what are the numbers in that third row?

10 A. Well, the numbers are going to be a lot larger here because
11 the racial preferences out of state are much larger. So for
12 whites, it's increasing by almost -- by over 1,900 admits; for
13 Asian Americans, like 5 -- over 560 admits. For African
14 Americans, you see a drop of almost 1,400 admits; and for
15 Hispanics, a drop of, you know, 1,800 admits.

16 Q. I think you misread the last one. What's the last one?

17 A. Oh, sorry. 1,080. That's --

18 Q. Thank you.

19 And, again, I think you may have said this, but just to be
20 clear, this is over the six-year period, correct?

21 A. Over the six-year period. So for a particular admission
22 cycle, you would want to divide that by six.

23 Q. Did you compute the total number of admissions affected by
24 racial preferences between the out of state and in state
25 together?

1 A. I did.

2 Q. Did you prepare a slide on that?

3 A. I did.

4 Q. And what does this slide show?

5 A. Well, this shows the change in the number of students
6 overall. So we're basically taking the differences that we had
7 on the previous two slides and then adding them together.

8 So in the first row, we've got the change for in state.
9 For in state, we saw an increase of 1,024 for whites; and then
10 for out of state, we saw 1,924. So that puts it at 2,948
11 total.

12 And to be clear, the way we're doing these capacity
13 constraints, we're holding the number of in-state admits fixed
14 and the number of out-of-state admits fixed when we do all
15 these calculations.

16 Q. Thank you.

17 And can you tell me the final numbers there in the third
18 row for the other races?

19 A. So for Asian Americans, the total increase would be 709
20 over the six-year period. For African Americans, it would be a
21 drop of 2,239; and for Hispanics, it would be a drop of 1,341.

22 Q. Thank you.

23 We've just now walked through four different kinds of
24 analyses that you've done regarding the effect of UNC's racial
25 preferences on admissions, correct?

1 A. Correct.

2 Q. What is the overall takeaway from those four different
3 statistical analyses?

4 A. Racial preferences are quite large, especially for
5 out-of-state applicants, and would have a substantial effect --
6 removing them would have a substantial effect on the racial
7 distribution of the class.

8 Q. Did Professor Hoxby do anything that purported to quantify
9 the effect of UNC's racial preferences on admission?

10 A. She did.

11 Q. What did she do?

12 A. So what she's going to do is look at what's called the
13 pseudo R-squared -- that was one of the measures of fit that's
14 produced by our models -- and say how much of that pseudo
15 R-squared can be attributed to race, and that's something
16 called a Shapley decomposition.

17 Q. Do you agree with that methodology?

18 A. I do not.

19 Q. What is wrong with Professor Hoxby's methodology there?

20 A. Well, there are two things. One, the pseudo R-squared is
21 not an appropriate measure for how well the model is doing at
22 what -- for what share of the variation of admissions the model
23 is explaining; and the second part is I don't think that the
24 Shapley decomposition is a correct way of thinking about the
25 problem because that has more to do with thinking about the

1 whole applicant pool.

2 Q. So let's look at those two things separately. I understand
3 that there's -- you were talking about the pseudo R-squared. I
4 want to talk about that first. And there is another metric
5 that's called an R-squared?

6 A. That's right.

7 Q. Is there a difference between the two?

8 A. There is. And so for what's called an R-squared, that
9 gives you how -- if we had, like, a normal regression, this
10 would be something where the outcome is continuous. So think
11 about earnings or something like that, and then you might have
12 a whole bunch of factors that might affect earnings, and then
13 you think, well, how much -- what share of the variation of
14 earnings is explained by the stuff that you're controlling for.
15 And that's an R-squared.

16 What a pseudo R-squared is -- and there are actually many
17 different kinds of pseudo R-squareds. It's trying to figure
18 out some way of relating what we see with the R-squared to
19 models where we don't -- that are not linear, where the outcome
20 is discrete like this, you know, it's being admitted or not.

21 And what's true about the R-squared and the pseudo
22 R-squared is higher values mean that you're fitting the data
23 better. That's how the two compare. But you can't say
24 anything more than that in terms of, you know, how much of the
25 variation you're actually explaining by using the pseudo

1 R-squared.

2 Q. So if you are an R-squared of, let's say, .50 -- I'll just
3 say .5 to keep the number simple -- what would that say about
4 how much the model explains about the variation of the data?

5 A. I'd say it explains about half the variation of the data.

6 Q. 50 percent?

7 A. That's right.

8 Q. If you had a pseudo R-squared the same number, .5, does
9 that translate into some percentage?

10 A. No.

11 Q. So does it have a natural interpretation?

12 A. It does not.

13 Q. In other words, the pseudo R-squared does not represent the
14 percentage of variation in the data explained by the model,
15 does it?

16 A. That's correct.

17 Q. So to be clear, let me give an example. You showed us
18 yesterday that the pseudo R-squared of your preferred in-state
19 model is .727, correct?

20 A. Correct.

21 Q. Does the pseudo R-squared of .727 mean that your preferred
22 in-state model explains 72.7 percent of the variation in the
23 data?

24 A. No. You can see that because -- and I showed you how
25 accurate my model was. The accuracy of the model was over

1 90 percent. So pseudo R-squared of, you know, .7 is
2 corresponding to an accuracy of over 90 percent.

3 Q. Let's turn to the other flaw that you found in
4 Professor Hoxby's methodology. Was there something
5 conceptually wrong with her use of this Shapley decomposition?

6 A. There is, and this is more of a -- of the two issues, this
7 is, I believe, the much more important one.

8 So what's going on here is that she's thinking about how
9 race affects the entire admissions process, and I don't think
10 that's the right way of looking at it. I think you need to be
11 thinking about how race matters for the groups that are
12 affected by that. You know, so if we're looking at preferences
13 for African Americans, you need to look at how it affects in
14 the -- rates for African Americans.

15 Q. Could you help us understand with an example?

16 A. Sure. So let's think about UNC's basketball team. Okay.
17 We know that there are going to be huge preferences given for
18 basketball players, but there's not going to be that many
19 basketball players, right. So it could be that the only reason
20 any of those basketball players got in is because of
21 preferences for the basketball players. So in that case, it
22 really would be determinative, right. That was why the
23 basketball players got in.

24 If you do the Shapley decomposition, it would basically say
25 basketball players don't matter at all because there's only so

1 few of them and you're spreading out -- you know, if we got rid
2 of that basketball preference, it would hardly affect anybody
3 because it's just so few applicants.

4 Q. So few basketball players, you mean?

5 A. So few basketball players, so it can't have a big effect on
6 everybody else.

7 Q. With tens of thousands of applicants UNC has each year?

8 A. That's right.

9 Q. So, in effect, does her Shapley decomposition methodology
10 spread the effect of UNC's racial preferences across those tens
11 of thousands of applicants each year?

12 A. That's correct.

13 **MR. FITZGERALD:** Object to the form.

14 **THE COURT:** Let me hear from you.

15 **MR. FITZGERALD:** Just leading, Your Honor.

16 **THE COURT:** Overruled. Go ahead.

17 Q. (By Mr. McCarthy) I'd like to turn to another issue raised
18 by Professor Hoxby. Are you aware of her discussion of
19 overfitting?

20 A. I am.

21 Q. Are you aware that she claims that your model is overfit?

22 A. I am.

23 Q. Before we get into the details of her claim about
24 overfitting, can you explain the concept of overfitting?

25 A. Yes. So the way -- what you're concerned about here is

1 that you have a model of admissions. Every time you control
2 for another thing, every time we add a new thing -- so we start
3 off. We add our test scores. Then we added UNC ratings. Once
4 you add the UNC ratings, the model is going to fit better.
5 Every time you add another variable, it's going to fit better,
6 and so you can just keep adding. But you might start picking
7 up things that are not real relationships because you just have
8 too many variables in there. So you might pick up spurious
9 relationships that just happen to be there because you didn't
10 have a lot of data given how many variables you were
11 controlling for.

12 Q. And by amount of data, you mean the number of observations
13 in the data set?

14 A. Yes, the number of observations in the data set, but also
15 related to those characteristics of the applicants.

16 Q. So is it a number of controls or variables relative to the
17 number of, in this case, applicants in the model?

18 A. That's a rough way of describing it, yes.

19 Q. When does overfitting occur?

20 A. Well, so when we're talking about overfitting, you're
21 usually thinking about, well, how well would the model predict
22 for people for whom you haven't estimated your model on. So
23 you can think about -- let's say instead of estimating it on
24 the full -- my full in-state data set, I could have estimated
25 it on 80 percent of that, and then said, well, how well does it

1 actually predict for the other 20 percent.

2 And what you're concerned about with overfitting is maybe
3 if you added a bunch of controls, it would actually start to
4 fit worse on the 20 percent. It's always going to fit better
5 in sample -- on the sample that you actually estimate it on.
6 The question is will it -- are you just picking up spurious
7 relationships. And so what overfitting is concerned about is
8 how well it's going to predict on the data you didn't use.

9 Q. So I want to make sure we understand something here. You
10 used the word "in sample," I think, and "out of sample"?

11 A. Correct.

12 Q. By in-sample data, do you mean the data that you used in
13 building the model?

14 A. The data we used to estimate the model. And if you're
15 worried about overfitting, you might have what's called a
16 holdout sample to then see, you know, how well does it predict
17 for your holdout sample, data you don't estimate on.

18 Q. Did you create a slide that uses a graphical representation
19 to explain overfitting?

20 A. I did. I will say it's a bit of stretch to say I created a
21 slide. This is a representation of things you'll find in
22 textbooks, the same sort of textbooks on how you deal with
23 overfitting.

24 Q. Thanks for the clarification.

25 Before you explain what the different colored curves in

1 here mean, I want to talk about what we're looking at a bit.

2 What is on the X axis there?

3 A. So this is how complex your model is. So, again, what you
4 think about is my Model 1 would be on the far left because it
5 has very little controls; and as we add more and more variables
6 to the model, the model becomes more complex as we're adding
7 more and more controls. And so where effectively the X axis is
8 how many of these controls do you have.

9 Q. Okay. Thank you. Ask then on the Y axis, what's there?

10 A. Well, so what's highlighted there is not the Y axis.

11 That's going to be the minimum of --

12 Q. Does that denote that line?

13 A. That denotes that line. What's on the Y axis is actually
14 the model error, you know, how badly does the model do at
15 predicting. So what you would like is the model error to be
16 zero ideally, right, and so lower numbers here are better.

17 Q. So having explained now what's on the axes, what is
18 depicted in the graph there by the blue line?

19 A. So the blue line was what I was saying about the -- for the
20 example that you're estimating on. As you add more and more
21 variables, your error will always go down. You're always going
22 to be able to predict better the more things you put into the
23 model. That's why the blue line is always going down.

24 Q. And that is for in-sample predictions, right?

25 A. That's for in-sample predictions.

1 Q. And then if we look at the red curve there, what does that
2 illustrate for us?

3 A. Well, that's showing how well it predicts on the data that
4 you did not estimate your model on; and it says that at some
5 point, if you keep adding controls, given how big your data set
6 is, you're going to start to pick up these spurious
7 relationships; and then your model will start to not fit as
8 well on -- on the data that you didn't estimate on.

9 So what Professor Hoxby's concern is, is that I have
10 effectively flooded the model with variables; and by flooding
11 the model with variables, I'm able to predict really well on
12 the data that I estimate on. And if she was correct, that
13 would be a problem because that would be saying I've only had a
14 really good fit, but it wouldn't apply to other data; I'm
15 picking up only spurious relationships.

16 Q. And -- and this is depicted by this red curve that goes
17 down as you add variables and gets down to a low point and then
18 goes back up as you continue adding variables. That side where
19 it continues to go up on the right side is where it's picking
20 up the effects of these spurious relationships?

21 A. Exactly. I should also point out that this is related to
22 how much data you actually have, right. You know, the more
23 data that you have, the more you're going to be able to do
24 better, you know, on that out-of-sample analysis.

25 Q. By data there, you mean the observations, as in like the

1 number of applicants for us?

2 A. Exactly.

3 Q. So if you are an economist who is trying to create a model
4 that's an accurate predictor, where do you want to fall on that
5 red curve?

6 A. Well, that would be at that minimum of the out-of-sample
7 error if you're solely interested in forecasting. That's not
8 the whole purpose of the models, but for the purposes of
9 prediction, that's what you want.

10 Q. And so that would be at the -- right at the middle on the
11 bottom of that U-shaped red curve?

12 A. That's correct.

13 Q. Having explained the concept of overfitting for us, can we
14 return to Professor Hoxby's claim that your model is overfit?

15 A. Yes.

16 Q. Did you prepare a slide outlining Professor Hoxby's
17 overfitting methodology?

18 A. I did.

19 Q. And can you explain here Professor Hoxby's methodology?

20 A. Yes. So there are sort of four parts to this. The first
21 part here is that she uses only three of the six years of the
22 applicant data. You recall what I was saying is that having
23 more years -- more data lessens the risk of you being overfit.
24 You're less likely to pick up those spurious relationships
25 given the same number of controls.

1 Then what she does is she estimates the models on one year
2 of data and tests the out-of-sample accuracy on the other two.

3 And then she's going to use what's called mean squared
4 error to quantify the in- and out-sample error to find that in
5 a slide or two, but it's just a way of saying, you know, how
6 well is the model predicting.

7 And then the key thing that I'm going to disagree with on
8 her methodology is the fourth one because she's going to
9 evaluate this overfit by saying, okay, what is the error out of
10 sample and then she's going to divide that by the error in
11 sample. And, you know, I love Carolyn Hoxby. She's a friend,
12 but this one, that's where this is wrong.

13 Q. So you mentioned that you find that last step wrong. Do
14 you find issues with the other steps as well?

15 A. I do, but those are minor in comparison to that last --
16 last step.

17 Q. Let's take a look at each one of them. Starting with the
18 first, what's wrong with that step of Professor Hoxby's
19 methodology?

20 A. Well, as I was saying, you want to have as much data as you
21 can, and she's only using three of the six years. So when you
22 have more data, then you can have more complicated models and
23 not be overfit.

24 Q. So using fewer years of data means fewer observations?

25 A. Yes. I mean, three of the six years, it's -- you're

1 cutting out -- it's not quite half because there are less
2 observations in the years that she tossed. But, yeah, you're
3 throwing away a lot of the observations.

4 Q. What do you find problematic about the second step of
5 Professor Hoxby's methodology?

6 A. What's problematic about the second step is that she's
7 estimating the model on one year of data and testing the
8 out-of-sample accuracy on the other two. Now, there are times
9 at various points where I do estimate a yearly model, in which
10 case that might be okay because that's what we're doing. But
11 generally, that's not the standard way of dealing with overfit.

12 What you generally want to do is you estimate on 80 percent
13 of the data and hold out 20 percent of the data. Here, after
14 throwing out the three years, she's estimating on a third of
15 the data and saying how well does it do in the other
16 two-thirds. So that's going to again make it look like
17 overfitting is more of an issue than it actually is.

18 Q. Then the third step, what do you find problematic about
19 that?

20 A. So the third step, there's just better ways of calculating
21 errors when the outcome is 0/1. So when she says "mean squared
22 error," here's what she means: People are either admitted or
23 rejected. If you're admitted, you get a "1." The error that
24 she's talking about is the model generates a predicted
25 probability of admission, so we're talking about 1 minus that

1 predicted probability of admission if the person was admitted
2 and squaring it. If you were rejected, it would be zero minus
3 the probability of admission and squaring it, and then we're
4 going to add them all up and average.

5 Q. That's the mean squared error?

6 A. That's the mean squared error. But when you're working
7 with models of this type where the outcome is just 0/1, that's
8 not really what you're trying to minimize, you know. What
9 you're really trying to do with an outcome that we're talking
10 about here is do something like accuracy, you know, how
11 accurate does your model predict. You're not trying to find
12 the one that has the smallest mean squared error in that setup.

13 Q. Let's move on to, then, the fourth step in Professor
14 Hoxby's methodology. This is the one that you said was
15 actually the bigger problem.

16 A. Yes. So the issue here is that if -- can we go back to the
17 previous slide?

18 Q. Sure.

19 A. When you're interested in overfit, you're interested in how
20 well the model predicts out of sample, right. So you're only
21 interested in that red line. It has nothing to do with the
22 blue line, okay.

23 So now we go back. What's happening here is that she is
24 using the -- dividing the out-of-sample mean squared error by
25 the in-sample mean squared error. If you're going to do that,

1 | you've lost all sense of figuring out a good way of defining
2 | whether your model is overfit, and the reason is as follows:
3 | If you think about a model that had -- controlled for
4 | absolutely nothing, it would be a really bad model, right,
5 | because it wouldn't be able to predict anything very well.
6 | That bad model would predict badly in sample and it would
7 | predict badly out of sample, likely equally badly. And that's
8 | going to be the model that would have -- according to Professor
9 | Hoxby's metric would look the best. So that clearly can't be a
10 | way of deciding whether the model is overfit.

11 | Q. So you have a problem -- your biggest problem is this
12 | metric she uses at the end where she divides out-of-sample mean
13 | squared error by the in-sample mean squared error?

14 | A. That's correct.

15 | Q. Did you prepare a slide that illustrates the problems with
16 | that kind of metric?

17 | A. I did.

18 | Q. Can you explain what this slide shows?

19 | A. So this shows Professor Hoxby's overfit measures for all of
20 | her models.

21 | Q. So if we looked on the left column, what does that
22 | identify?

23 | A. So Professor Hoxby estimates nine models, and that's
24 | similar to what I did. You know, I estimated a series of
25 | models, and in each model, I add more things to the model.

1 That's what Professor Hoxby is doing as well.

2 Q. And then if we -- let's start with the second column. If
3 you go to the second column, what does the slide illustrate
4 with regard to in-sample mean squared error?

5 A. So that in-sample mean squared error is like the blue line
6 on that overfit graph. As you add more and more controls, your
7 model is going to fit better and better on the data that you
8 estimated on.

9 Q. And is that why the mean squared error is going down that
10 whole time?

11 A. It's going down the whole time. It starts at .169 and ends
12 at .101.

13 Q. So from the perspective of in-sample error, which one of
14 her models is best?

15 A. Model 9.

16 Q. Let's go over to the third column where it says
17 "Out-of-Sample MSE," or mean squared error, at the top. What
18 does this slide illustrate in this column with regard to
19 out-of-sample mean squared error?

20 A. So to just back up for just one moment, she calculated the
21 in-sample mean squared error. She's estimating on the one year
22 of data and then seeing how it does in the other two years. So
23 on that one year of data, that would be the in-sample mean
24 squared error.

25 Now, for the out-of-sample mean squared error, we're

1 talking about how well it did on the two years that they didn't
2 use -- that she didn't use; and there what you can see is that
3 it's always going down. You can also see that it's always
4 higher than the in-sample mean squared error, and that makes
5 sense because the model is going to do better on the data that
6 you actually estimated on.

7 Q. So if we --

8 A. Go ahead.

9 Q. -- if we look at the mean squared error, again, out of
10 samples on the third column, this is going down the entire
11 time?

12 A. Well, there's something going on between Model 1 and 2.

13 Q. Thank you.

14 A. But generally it's going down every single time.

15 Q. And which is -- with regard to out-of-sample error, that
16 is, which one of these is the best?

17 A. Model 9.

18 Q. So what does this mean when we look at those two columns
19 there of the in-sample error and the out-of-sample error? What
20 does this mean with regard to the accuracy of Professor Hoxby's
21 models?

22 A. Well, the most accurate model is going to be Model 9. We
23 haven't done accuracy here, but it has the lowest out-of-sample
24 error.

25 Q. And in as well, correct?

1 A. What?

2 Q. And in-sample error as well, correct?

3 A. That's right.

4 Q. So let's look at the first column where it says up there at
5 the top "Increase in Mean Squared Error, Out-of-Sample Relative
6 to In-Sample." That's the metric Professor Hoxby uses?

7 A. That's the metric Professor Hoxby uses. So Professor Hoxby
8 doesn't show what's in the second and third columns, which
9 actually doesn't cure this for Models 1 through 8. She's going
10 to show it only for Model 9 and then for my models.

11 Q. So what do we see there in that column of data?

12 A. Well, you can see that the higher numbers are in the more
13 complex models. So, you know, 7, 8, and 9, it's all about
14 5 percent.

15 Q. And that's the -- on her metric, the metric is highest at
16 her Model 9?

17 A. Well, it's actually highest -- highest at Model 8.

18 Q. Thanks.

19 A. But the point is that the one that does the best is her
20 first model, which has hardly any controls, right. So
21 according to that metric, the simplest model would look the
22 best, but that simplest model is a much, much worse model for
23 the purposes of prediction because the out-of-sample error is a
24 lot higher for that first model.

25 Q. So her metric which purports to show accuracy doesn't

1 actually match up with the accuracy?

2 A. Metric which purports to show out-of-sample fit doesn't do
3 that, yes.

4 Q. Did you examine how well your model fits out of sample?

5 A. I did.

6 Q. And how did you do that?

7 A. Well, I took everything about Professor Hoxby's
8 methodology, which really stacks the deck against me because we
9 are throwing away a lot of that data, and the only thing I
10 changed was the fourth point, which is I'm not going to use
11 what's in that second column because that's just wrong. What
12 we're looking at is the in-sample and out-of-sample mean
13 squared error, and we're going to see what model fits the best
14 out of sample.

15 Q. Did you prepare a slide showing this analysis?

16 A. I did.

17 Q. What do you show with the data in this slide?

18 A. So I show my average mean squared error of my in-state and
19 out-of-state models, Models 2 through 7 for in state, 2 through
20 6 out of state, and then Professor Hoxby's Model 9. And,
21 again, I estimate on the one-year forecasting on the other
22 ones.

23 Q. You're using her methodology, except for the faulty metric?

24 A. Yes.

25 Q. And so just to make sure we have our bearings here, on the

1 left side you've got a panel data, and that's for in state,
2 correct?

3 A. The left side is for in state, correct.

4 Q. Okay. What does the in-sample error column show for your
5 in-state models?

6 A. Well, it shows exactly what you would expect, that it's
7 going down. The one exception is Model 5. Keep in mind Model
8 5 is the exact same as Model 4, just estimated on a smaller
9 data set because we threw out some of those high schools that
10 didn't have very many applications. So you wouldn't expect it
11 to fall from Model 4 to Model 5, but everywhere else it's
12 falling.

13 Q. And then if we move over one column to the right, what do
14 the out-of-sample columns show for your in-state models?

15 A. Well, it shows it goes down at first, and then when we look
16 at including high school fixed effects for Model 6 and Model 7,
17 we're including census track, now the out-of-sample fit becomes
18 worse. And that's what we mean by these spurious relationships
19 because you can have a high school that looks like, oh, wow,
20 that school really prepares people well to be admitted to UNC,
21 but maybe that's just because you didn't have many observations
22 from that high school. So that's where you run the risk of
23 being overfit.

24 Q. And the point where the out-of-sample error reaches its
25 minimum, that's important, correct?

1 A. That's correct.

2 Q. And that's -- that's the point that you've told us about at
3 the bottom of that red, U-shaped curve, right?

4 A. That's right. And so here the one that does the best,
5 according to Hoxby's criteria, would be my Model 4.

6 Q. If we look over on the panel of data on the right, that's
7 now your out-of-state models, correct?

8 A. That's correct.

9 Q. And what does this show?

10 A. It shows basically the same patterns, right. So in sample,
11 it's going down until you hit Model 5, and Model 5 is -- again,
12 that's a smaller data set, so that's why it would go up on
13 Model 5. Model 5 and Model 4 are the same, except just
14 slightly different data. Now, Model 5 has a higher in-sample
15 error than Model 6. That's just adding the high school fixed
16 effects to Model 5. So this is consistent with that blue line.
17 Where you add controls, you're going to fit the data better.

18 Q. And what happens in the third column on that one?

19 A. In the third column, now you can see again that it goes
20 down at first, and my preferred Model 4 looks great according
21 to this -- Professor Hoxby's metric with the right outcome
22 measure. But then as you add the high school fixed effects,
23 it's going to be overfit, which I think makes sense.

24 Q. And from the perspective of out-of-sample error, where is
25 the low point?

1 A. Well, the best one is Model 4.

2 Q. So is your Model 4 -- that's your preferred model, correct?

3 A. Correct.

4 Q. Is your Model 4 overfit?

5 A. No, it is not.

6 Q. Now, there's one more thing on this slide. At the bottom
7 it shows something about Professor Hoxby's preferred model, her
8 Model 9, correct?

9 A. That's correct.

10 Q. And what's illustrated there?

11 A. The in-sample and out-of-sample fit for Professor Hoxby's
12 model, and so those two models were actually on the previous
13 slide.

14 Q. And they were the minimums for her?

15 A. They were the best ones for her, that's correct.

16 And the big thing that you can see here is that my numbers
17 are going to be lower out of sample than her numbers are going
18 to be in sample, with the exception of Model 2 in state and
19 Model 6 out of state.

20 My preferred model fits the data better out of sample than
21 hers does in sample. That tells you my model is much better,
22 you know, in terms of forecasting UNC's admissions decisions
23 and is not overfit.

24 Q. Did you look at other ways of testing whether your model
25 was overfit?

1 A. Yes, I did.

2 Q. And how did you do that?

3 A. Well, now I'm going to correct the other parts of my
4 criticisms of Professor Hoxby's model, so I'm going to use all
5 the data and I'm going to use appropriate -- you know, I'm
6 going to estimate on 80 percent of the data and then forecast
7 on 20 percent rather than doing this estimate on one year of
8 data and forecast on the other two years of data.

9 Q. Did you prepare a slide to illustrate your analysis?

10 A. I did. I should have mentioned the one other thing I do,
11 which is accuracy, which is I think is the appropriate metric
12 when your outcome is 0/1.

13 Q. This is the point you explained previously about mean
14 squared error?

15 A. That's right.

16 Q. What did the data on this slide show?

17 A. So this shows the out-of-sample accuracy for Models 2
18 through 7 and 2 through 6 in state and out of state for me and
19 then for Professor Hoxby.

20 Q. What does this slide show about whether or not your models
21 are overfit?

22 A. So keep in mind all of this is out of sample, okay. And
23 it's the same thing here where -- actually, if you look in
24 state, even including those high school fixed effects can make
25 your model more accurate out of sample now because now you're

1 using more data. You're using the six years of data, so you're
2 able to still do better by having those high school fixed
3 effects in there.

4 Q. Is that because the increased amount of data can
5 accommodate more variables?

6 A. That's right.

7 So, if anything, according to this slide, my Model 4 would
8 be underfit, not overfit. So the fact that it predicts so
9 well, it's not because I'm picking up a bunch of spurious
10 relationships.

11 So the way you see that here is if you look at the overall
12 accuracy in the first panel in state, you can see for Model 2
13 it starts out at 87.4. Then it's 91.9. It's just slightly
14 different for Model 4, because Model 4 and Model 3 are actually
15 pretty similar. Keep in mind that Model 5 is just on a
16 slightly different data set. It's just as accurate for that.
17 And then the number is actually higher for the high school
18 fixed effects. So the high school fixed effects one here does
19 the best at predicting out of sample.

20 Q. So after doing all of this analysis of accuracy and
21 overfit, what's the takeaway about your models?

22 A. Well, that they're very accurate without being overfit
23 until you do something like have census tracks for Model 7 or
24 high school fixed effects when you're going out of state. But
25 I also should say that Hoxby's models are pretty accurate as

1 well. They're just not as accurate.

2 Q. Thank you.

3 I'm going to turn to a different topic now. Yesterday we
4 discussed briefly applicants in special recruiting categories.
5 Do you remember that discussion?

6 A. I do.

7 Q. And at the time you said that you did not include them in
8 your models because they had admit rates of 97 percent or
9 higher?

10 A. That's correct.

11 Q. And you stated that you left them out because you wanted to
12 make apples-to-apples comparisons?

13 A. That's correct. And a lot of this has to do with not
14 really knowing what all those fields were.

15 Q. And about how many of those applicants were there in this
16 special recruiting category? I think you said it was around
17 9,000?

18 A. 9,000, sort of equal between in state and out of state.

19 Q. And that's over the six-year period?

20 A. That's right.

21 Q. Out of the total of about 200,000?

22 A. That's right. Now, even then it's a bit of an
23 overstatement because some of them out of state could be
24 foreign applicants and so they would have been removed through
25 that count.

1 Q. As you discussed yesterday?

2 A. Yes.

3 Q. Are you aware that Professor Hoxby criticizes you for not
4 including these applicants in special recruiting categories in
5 your model?

6 A. I am.

7 Q. And what is her position?

8 A. Well, they're part of the admissions process, so they
9 should be a part of the model.

10 Q. That's her position?

11 A. That's her position, yes.

12 Q. When Professor Hoxby included these applicants in her
13 model, did she control for status in those special categories?

14 A. No, she did not.

15 Q. Did she ever control for status in a special group?

16 A. The closest she gets to that would be if she controls for
17 whether you were a high school athlete.

18 Q. Did you end up including applicants from these special
19 recruiting categories in your model?

20 A. Yes, responding to Professor Hoxby's criticism.

21 Q. And did you look at the accuracy of those models when you
22 did that?

23 A. I did.

24 Q. Did you prepare a slide showing that analysis?

25 A. I did.

1 Q. Can you tell us generally what's on this slide?

2 A. So this is in response to Professor Hoxby who for this
3 analysis focused on my Models 2 and 3.

4 Q. So even though those are not your preferred model, you're
5 doing those here?

6 A. That's right. And the metric that she focuses on is the
7 pseudo R-squared, and I'm also going to show you the overall
8 accuracy, though the story is going to be very similar.

9 Q. And did you do anything different than Professor Hoxby when
10 you were analyzing this accuracy here?

11 A. Well, so I think it's probably best just for me to walk
12 through that first panel. So Model 3 in that -- in-state Model
13 3, that .715, that's the pseudo R-squared for my Model 3; and
14 what she points out is that if you just add those special
15 categories into the model, the fit of the model falls. So now
16 the pseudo R-squared is .688.

17 Now, here it's important to keep in mind the types of
18 people that are in these categories. One of those groups is
19 going to be recruited athletes, okay. Now, for that, you have
20 to include a bump for recruited athletes. There might be other
21 ones that are, like, scholarship winners.

22 Q. You mean a control?

23 A. Yeah, a -- if you're going to have recruited athletes in
24 there, you should really have a bump for being a recruited
25 athlete because that's very helpful for your admission. For

1 others, you know, if it's based on the fact that you're
2 incredibly talented academically and such, well, my model would
3 already predict that really well.

4 So the only way that that pseudo R-squared can fall by
5 putting those people back in is if there's some set of people
6 where things are operating differently, and the perfect example
7 of that would be recruited athletes. Well, one way of -- I'm
8 not taking a stand on which of these groups falls under what
9 category. It's just a control for were you in one of these
10 special groups.

11 Q. How do you do that? I'm sorry. How do you do that?

12 A. Well, we put a variable in the model that says: Were you
13 in one of these special UNC categories?

14 Q. Is that what you mean there on the slide where it says
15 "plus special indicator"?

16 A. That's right. So if you add to the model they were in one
17 of these special categories, now the model actually fits
18 better. You have a higher -- a higher pseudo R-squared. It
19 goes now from .715 up to .732 with that control.

20 Q. So let's walk through that a little bit more slowly in
21 terms of the data. So if we start with Model 3 for in state,
22 so that first column, the pseudo R-squared is what?

23 A. .715.

24 Q. And then as you go down one cell, that's -- in that second
25 cell of the first column, that's after you add in the

1 applicants from the special recruited categories?

2 A. That's correct.

3 Q. And then if you go down one more to the third cell in that
4 first column, that's -- now you've got the special recruited
5 categories applicants in there and this is where you added that
6 variable that identifies status in one of those categories?

7 A. That's correct.

8 Q. And so what do we see about that pseudo R-squared as
9 compared to the two above?

10 A. That's the highest one.

11 Q. And if we keep going down that column, now we're talking
12 about Model 2, right --

13 A. That's right.

14 Q. -- the next three cells? What do you see among those?

15 A. The same pattern, where if you just include those special
16 applicants, the pseudo R-squared will follow. And it makes
17 sense because there's no way that the model that doesn't have
18 anything for, say, athletic preferences is going to be able to
19 predict why those athletic recruits got in.

20 Q. Now, if we look out of state, so the second column here
21 where we're still showing the pseudo R-squared, if you look at
22 the top three cells there, what do we see for Model 3 as you go
23 through that same process?

24 A. It's the same pattern. We have the pseudo R-squared for my
25 Model 3 of .84 [sic]. It falls to .522, and then it goes up to

1 .64.

2 So when we talk about removing those special groups, those
3 are, in a sense, the easiest ones to predict if you account for
4 the fact that they were special there; and if we adjusted it
5 with recruited athletes and included that bump, those guys are
6 really easy to predict.

7 Q. And that's for Model 3 and Model 2, correct?

8 A. That's correct.

9 Q. If we look over to the panel on the right, "Overall
10 Accuracy," what do we see there for Models 2 and 3 when you do
11 this same process?

12 A. Well, you can see that -- actually, for Model 3, if you
13 just add the specials in state, it seems like it does just as
14 well. But the general pattern is that once you account for
15 that special indicator, your accuracies are actually much
16 higher than my original model when we didn't have the specials
17 in there.

18 Q. So in the end, what does this analysis show about whether
19 you include special recruiting category applicants in your
20 model or not?

21 A. Well, it matters how you include them. If you're going to
22 ignore the fact that recruited athletes get a big bump, that's
23 going to lead to a less accurate modeling.

24 Q. Does this analysis say anything about your analysis without
25 the applicants in special recruiting categories?

1 A. Well, in my opinion, it means that I'm tying my hands a bit
2 by not having the special ones in there because those are
3 actually the easiest ones to predict.

4 Q. Does it undermine any of your results or conclusions?

5 A. No.

6 Q. Did you further examine how including special recruiting
7 categories might affect your model?

8 A. I did.

9 Q. Did you examine how including them might affect the
10 coefficients in your model that we saw earlier?

11 A. I did. And so the criticism that Professor Hoxby raised
12 was that if you include those special recruiting categories,
13 the coefficients on race fall; and, again, the reason that they
14 fall is because you haven't accounted for the special
15 recruiting category, okay. And I think that that sort of
16 really relates, again, to the athletic preferences. You know,
17 if you're an athlete, you're getting in not because of your
18 race or anything like that.

19 Q. So what do we see now? If we look at the panel on the
20 left, okay, and let's start with the first column, "In-State,"
21 and let's focus on the top three cells there. So, again, we're
22 dealing with your Model 3 here, correct?

23 A. Correct.

24 Q. So this is still not your preferred model, right?

25 A. That's correct.

1 Q. And tell us what happens there with your Model 3 as you do
2 this process of adding in special recruiting category
3 applicants and then including a variable to denote presence in
4 one of those categories.

5 A. So we start off with .285 [sic] and it falls a bit to 2.4
6 when you just add those special recruiting categories in, but
7 then once you account for the fact that you're in special
8 recruiting category, then the number is basically the same as
9 what we had at the beginning, it's off by .03.

10 Q. And if we move down that column -- this is Model 2. This
11 has even fewer variables than Model 3. And what do you see
12 there when you add in the special recruiting categories and
13 then that indicator variable?

14 A. Well, the coefficient falls. It doesn't really fall by
15 that much. But then, once again, when you put in the special
16 indicator, then they're almost the same.

17 Q. If we look out of state now -- let's start with Model 3 --
18 what kind of pattern do you see there?

19 A. Again, we start off with 5.85. Now it falls quite a bit to
20 4.3., which is still actually a very big number. And then when
21 you add the specials, it's a little bit lower than it was in
22 Model 3, but, again, I would say not much.

23 Q. And do you see a similar pattern exhibited for Model 2 out
24 of state?

25 A. Yes, it's the same pattern.

1 Q. If we look over to the panel of the slide on the right,
2 these are your coefficients on Hispanics, correct?

3 A. That's correct.

4 Q. And if we first look in state there, what do we see there?

5 A. The same pattern, where it drops with the inclusion of the
6 specials and then basically gets back up almost to the same
7 value as what we had initially.

8 Q. And that's once you include that variable controlling for
9 presence in one of those special recruiting categories?

10 A. That's correct.

11 Q. If we go down from there to Model 2 --

12 A. Same pattern.

13 Q. Same pattern?

14 A. Yes.

15 Q. Then let's go over to the out-of-state models, Model 3;
16 same pattern?

17 A. Same pattern. The numbers are a little bit lower, but
18 basically the same pattern. We're talking about 3.01 versus
19 2.9. That's not much.

20 Q. Again, these are not your preferred model?

21 A. That's right.

22 Q. This is just showing -- illustrating the point you're
23 making here?

24 A. Correct.

25 Q. Same pattern for the coefficient on Hispanics for

1 out-of-state applicants when you do the same thing?

2 A. Yes.

3 Q. I want to move on to another issue that Professor Hoxby
4 raises. Are you aware of Professor Hoxby's criticism of the
5 method you chose to account for missing performance variables
6 in the data set?

7 A. I am.

8 Q. And this is -- these missing performance variables, what
9 are those?

10 A. Well, this is if, like, you're missing your high school
11 GPA.

12 Q. And is that in the data set, there are some applicants for
13 whom there is no high school GPA?

14 A. That's correct.

15 Q. How do you account for these missing scores in your models?

16 A. So I'm going to be quite flexible in how I'm accounting for
17 them, and what I'm going to do is I'm going to estimate a
18 separate coefficient where if you're missing it and you're
19 African American, missing it and you're white, missing it and
20 you're Asian American; and then what happens is the model --
21 so, basically, we have that variable in the model, and then you
22 also have GPA in the model. GPA, if you're missing it, that
23 valuable will be zero, okay.

24 And so what -- when we estimate these coefficients on
25 missing GPA interacted with race, it basically says we're going

1 to let the model decide what GPA to fill in for you if you're
2 missing it, and we're going to allow that to be different by
3 race. There are other ways we could pursue it. This is just
4 the way of letting the model decide.

5 And the way the model decides it is it says, look, we have
6 an African American applicant, and it looks like they're being
7 admitted at this rate with this particular GPA. Let's say it's
8 a B. And that seems to best match with what the admit rate
9 would be for people who are -- blacks who are missing that GPA.
10 So that coefficient on African American times missing GPA will
11 effectively give you out something that would be equivalent to
12 a GPA of a 3 in the model. But that number can be different
13 for different races.

14 Q. Does Professor Hoxby use a similar method?

15 A. Well, she's just not going to do that interaction.

16 And I should say that it's not really the fact that I do
17 that interaction that she objects to. It's more that when I do
18 all my turning off of racial preferences, I don't do anything
19 with those variables. So I'm not affecting anything with
20 regard to missing grades and race.

21 And the reason I don't do that is because there are sort of
22 two ways of looking at the problem. The first way would be
23 they actually do have different GPAs that I don't actually see,
24 okay. That's how I'm interpreting those coefficients. But the
25 alternative way would be to say racial preferences operate

1 differently if you're missing a GPA, and there's nothing in the
2 record to indicate that.

3 **MR. MCCARTHY:** Your Honor.

4 **THE COURT:** Yes.

5 **MR. MCCARTHY:** I'm realizing that we're around the
6 time for our midmorning break.

7 **THE COURT:** We are.

8 **MR. MCCARTHY:** I would guess that I probably have,
9 including the proffer that you're going to allow us to make,
10 I'm guessing probably 30 to 40 minutes, give or take. Would
11 you like to take a break now?

12 **THE COURT:** That makes sense to me. Let us recess for
13 15 minutes. We will resume at 11:10.

14 **MR. MCCARTHY:** Thank you, Your Honor.

15 **THE COURT:** Thank you.

16 (A morning recess was taken from 10:55 a.m. until
17 11:10 a.m.; all parties present.)

18 **THE COURT:** Yes, sir. You may resume.

19 **MR. MCCARTHY:** Thank you.

20 **THE COURT:** Uh-huh.

21 Q. (By Mr. McCarthy) Professor Arcidiacono, before the break,
22 we were talking about missing GPAs, that is, high school grade
23 point averages, in the data, correct?

24 A. Correct.

25 Q. Did you do any analysis to show why GPAs that are missing

1 actually do vary by race?

2 A. I did.

3 Q. And did you prepare a slide showing that analysis?

4 A. I did.

5 Q. What does this slide show generally?

6 A. So this shows -- compares high school GPAs and performance
7 ratings, which really are based a lot on your grades.

8 Q. Will you slow down a little bit for the court reporter?

9 A. Sorry. It compares high school GPAs and performance
10 ratings. Performance ratings reflect high school grades by
11 race and missing GPA status.

12 Q. And the performance rating there, that's UNC's performance
13 rating?

14 A. That's correct.

15 Q. So if we look on the first panel there where it says "Grade
16 Point Average," can you tell us what the data in that table
17 tell us?

18 A. Well, that's showing in-state GPAs and showing what the
19 average is in state and out of state by race. And so then you
20 can see that it's higher for whites and Asians than African
21 Americans and Hispanics in state, and then out-of-state African
22 Americans are a bit lower. So what that means is, you know,
23 one way of thinking about how to assign the missing GPAs would
24 be to instead use what you see everybody else has.

25 Q. Well, let's move over, then, to the second panel. What do

1 the data show there?

2 A. Well, this shows the performance rating for when the GPA is
3 present versus not. And so what you can see here is that if
4 you have a GPA present -- you know, whites actually have the
5 highest performance rating when GPA is present; and if GPA is
6 missing, whites have also high performance ratings. Then Asian
7 Americans are second highest on the performance rating when GPA
8 is present and highest when it's missing. African Americans
9 are lowest on both, and then Hispanics are sort of in between.

10 Now, what that means is performance rating in some sense is
11 capturing -- it's not completely GPA based because it also
12 takes into account whether you were rising in terms of your
13 grades or falling, but grades are a big component of that. And
14 so it suggests that if you're missing GPA and you're -- in
15 these particular races, the GPA is probably reflecting -- it's
16 going to be different across races, somewhat similar to what we
17 see in the first panel.

18 Q. And is this in part because the performance rating
19 typically captures the GPA normally?

20 A. That's right. I should say the second panel was for in
21 state, and we repeat the analysis for out of state. And, there
22 again, you see whites and Asian Americans having higher
23 performance ratings both when their GPA is present and when the
24 GPA is missing. That's suggesting that, you know, when GPA is
25 missing, the reader still has some information in the file to

1 figure out this performance rating. That's suggesting that
2 information would imply a particular GPA.

3 Q. Did you look at alternative ways of dealing with missing
4 GPAs?

5 A. I did.

6 Q. And did you prepare a slide showing the various methods
7 that you employed for dealing with them?

8 A. I did.

9 Q. As a general matter, what are you depicting in this slide?

10 A. So different ways of imputing this missing GPA. I like the
11 way I do it the best. That's my model. That's where I'm
12 interacting race with missing GPA, and in doing that, I'm
13 letting the actual UNC admissions decisions reveal what GPA
14 should be there for -- if you're missing it, and it's going to
15 reveal something different depending on your race.

16 On the other side, I show two alternative ways of putting
17 your GPA in. Instead of doing these -- adding a bunch of
18 variables here, I'm just going to say I'm going to give you a
19 GPA. One way would be to give you the GPA that's the average
20 for your race. That would be separate for in state versus out
21 of state.

22 The other way would be not to use race at all, but to take
23 the other information we have in the data to predict it, and
24 that would be doing things like controlling for your
25 performance rating and let that -- so for some people you

1 actually have both GPAs and performance rating. You can
2 estimate a relationship between those two. That's going to
3 give you some coefficients on that performance rating, and then
4 you can use those coefficients and the performance rating for
5 those who don't have a GPA to predict what their GPA would
6 likely be given their performance rating. And that doesn't use
7 race at all.

8 Q. So in the method you use in your model, it's the model that
9 essentially gives you that missing GPA?

10 A. Yes, but I don't even like saying it's the model because
11 it's what the admissions decisions reveal that are giving it.
12 But that, of course, is in the context of the model.

13 Q. Thanks for the clarification.

14 A. I am not in any way posing that African Americans who are
15 missing GPA have lower GPAs in that case. What gets revealed
16 from the model may be that, but it's totally governed by what's
17 happening in the data.

18 Q. Understood.

19 Did you conduct an analysis to determine whether these
20 alternative methods affect the magnitude of racial preferences?

21 A. I did.

22 Q. And did you prepare a slide showing that analysis?

23 A. I did.

24 Q. There's a lot of data on this one, so why don't you tell us
25 at a high level what's being depicted overall in this slide.

1 A. So I've got to remind myself here.

2 Q. There's a lot, I know.

3 A. Okay. So in the "Preferred" column, I'm showing the
4 results from my preferred model, and that's going to be done
5 separately for in state and out of state.

6 Q. And what is it you're showing? Is this an average marginal
7 effect?

8 A. Well, I'm showing in the rows three things. The first is
9 your average admission probability with racial preferences.
10 The way these models are set up, I'm always going to hit that,
11 okay. Whether I impute the way I did it or use these
12 alternative imputation procedures, I'm going to get that
13 admissions probability because that's basically what's in the
14 data. The model is going to match what happens in the data on
15 average.

16 So that's why you'll notice in the first row all the
17 numbers are the same. You have 30.5, 17.1 in the first panel;
18 move one panel over, first row 30.5 and 17.1, and so on.
19 Similarly, when we go to Hispanics, you see it's 41.0, 20.3 in
20 the first row for Hispanics; 41.0, 20.3, because that's just
21 matching what's actually in the data.

22 Q. The status quo, if you will?

23 A. That's right.

24 Now, the second and third rows are where you're going to
25 see differences. So in the second row, we're calculating your

1 average admission probability without racial preferences. So
2 we're turning those effects of race off, and we're saying what
3 is that admit probability using these -- both my preferred
4 method and these two other ways of imputing the missing GPAs.

5 Q. So let's look at the first -- let's look just at the
6 baseline here with your preferred model on the left. And what
7 do we see there?

8 A. Well, this is information we've seen before in that we're
9 showing the average admission probability without racial
10 preferences in state would be 17.8 percent. The marginal
11 effect of race is the difference between those two
12 coefficients, which is the 12.7 percent. And then the analysis
13 repeats for out of state, and those are all numbers that I've
14 already talked about.

15 Q. So now that we have that as your baseline here, we've
16 reestablished that, let's look what happens if we look in the
17 middle panel for African American applicants. And that "Impute
18 1," that's your alternative -- the first alternative you
19 identified in the previous slide, right?

20 A. That's right. And what that does is it just assigns the
21 average for your race instead.

22 Q. So tell us what the data show there.

23 A. Well, there the average admission probability without
24 racial preferences is actually lower than my preferred model,
25 17.4 percent. So --

1 Q. That's in state, correct?

2 A. That's in state.

3 And so that implies the marginal effect of race is higher
4 in state under this alternative imputation method -- sorry --
5 of 13.2 percent, but they're -- they're not wildly different
6 here. They're fairly close. For out of state, it goes
7 slightly in the other direction. So now the average admission
8 probability without racial preferences is 1.7 percent. That's
9 still very close to what it was in my preferred model. So the
10 differences are not that big.

11 Q. If we move over one more time to the third panel at the
12 top, this is, again, African American applicants, and this is
13 under your second alternative way of imputing these missing
14 scores, right?

15 A. Right. And this way does not use race at all. In here,
16 you can see that the numbers are, again, very similar. So in
17 state, the average admission probability without racial
18 preferences is just .1 percent higher. Out of state it is a
19 little bit different in that it's now 2 percent, but that still
20 leaves a very large marginal effect of race out of state of
21 over 15 percent.

22 Q. Now let's move down to the panels on the lower half of the
23 slide and see what happens with Hispanic applicants. Now,
24 again, the panel on the far left on the bottom, that's your
25 status quo that you already showed us, right?

1 A. That's correct.

2 Q. Okay. So then you can start with the second panel there,
3 which is your first alternative for imputing the missing
4 scores, correct?

5 A. That's correct. And the patterns, they're basically the
6 same. We're talking about very small changes relative to my
7 preferred model. So the main point here being how you do this
8 imputation, that's not where the body is buried. There's no
9 real action happening there.

10 Q. So what do we see for --

11 A. So we see --

12 Q. Go ahead. Sorry.

13 A. -- that in state the average probability of admission
14 without racial preferences is 31.4 percent versus 31.2 percent
15 in my preferred model. That's a very small difference. Out of
16 state it's 5.9 percent versus 6 percent.

17 In the final panel where we don't use race at all, we see
18 that they're a little bit higher admissions without racial
19 preferences, but not much. So we're talking about 31.9 percent
20 versus 31.2 and 6.3 versus 6 percent.

21 Q. Thank you.

22 What, then, is the takeaway from this analysis about your
23 alternative methods for imputing missing performance scores?

24 A. They don't matter for estimating the effect of race.

25 Q. Thank you.

1 I'd like to turn to another issue. Professor Hoxby, does
2 she criticize you for including the personal quality rating in
3 your model?

4 A. She does. She actually criticizes me for including all my
5 ratings. I think it's especially so because I do think there
6 is a racial component to the personal quality rating.

7 Q. And I think she used the word "endogenous"?

8 A. Endogenous, yes, that would be one way, which is to say
9 it's affected by race.

10 Q. Now, is it correct to include the personal quality rating
11 in your models?

12 A. It really depends on what you're trying to do. So if
13 you're trying to figure out how formulaic UNC's admissions is,
14 then you need to include all the components of the formula, and
15 the personal rating is one of those components. So from that
16 perspective, you want to include it.

17 For the purposes of figuring out how big racial preferences
18 are, you would not want to include it because part of the
19 effect of racial preferences would then be operating through
20 the personal rating. The key is here that most of the action
21 in terms of how racial preference operates is not through that
22 personal rating. It's a small effect, but the main action is
23 the direct bump you get for race.

24 Q. So what happens -- if including it, what does that actually
25 do with the size of the preferences in your analysis?

1 A. Well, it's going to make the preferences appear smaller
2 than they really are. So in that way, I'm actually being
3 conservative in my estimates of how big racial preferences are.

4 Q. Now, yesterday you mentioned having served as an expert in
5 the *Harvard* case, correct?

6 A. That's correct.

7 Q. And in that case, you removed Harvard's personal ratings
8 from your model, correct?

9 A. In my preferred model I did, yes.

10 Q. Thank you. And why did you do that?

11 A. Because race clearly affected the personal rating, and it
12 accounts for about half what I believe is the -- less than half
13 of what I believe is the discrimination against Asian
14 Americans.

15 Q. So you took it out so you could identify that effect there?

16 A. That's right. In *Harvard*, I was not testing for whether
17 the process was formulaic.

18 Q. So why did you do differently here?

19 A. Well, for one, we're trying to see how formulaic UNC's
20 admissions are; and for two, it doesn't matter that much. So
21 why have a fight about these ratings? If we're estimating a
22 model on being formulaic, we're going to do this. Estimating
23 the effect of race, we're going to do another model. I think
24 things are complicated enough as it stands.

25 Q. And as you said before, if you took it out, that would

1 actually make the racial preferences be larger, correct?

2 A. That's correct.

3 Q. So your way of doing it is more conservative in showing the
4 size of the racial preferences?

5 A. That's correct.

6 Q. Did you actually analyze whether removing the personal
7 quality rating from your model would increase the size of UNC's
8 racial preferences?

9 A. I did.

10 Q. And did you prepare a slide showing this?

11 A. I did.

12 Q. So can you tell us at a high level what's depicted on this
13 slide?

14 A. So this is calculating the average marginal effect of race
15 when personal quality is removed from my preferred model.

16 Q. So what are we looking at on the left panel there?

17 A. On the left panel, we're looking at, for African Americans
18 in my preferred model, what the average admissions would be
19 with racial preferences. That's in the first row. You've seen
20 those numbers many times now because those are the actual admit
21 rates my model matches and will match whether the personal
22 rating is in the model or not.

23 What we change a little bit is the next line, which is your
24 probability of admission when racial preferences are removed,
25 and here those -- we didn't put out the baseline to show you,

1 but the numbers are smaller, okay. They're -- and that
2 means -- so 17.6 percent and 1.4 percent. I think for out of
3 state I remember the number being 1.5 percent. So it makes it
4 smaller, but not by much.

5 Okay. The marginal effect of race is the difference
6 between the second row and the first row; and there, because
7 the numbers in the second row are smaller, that means the
8 marginal effect of race is higher.

9 Q. So would you like to go back to the previous slide, No. 61,
10 so you can show the status quo?

11 A. Sure.

12 Q. And that's the one on the top left because we're talking
13 about African Americans?

14 A. That's right.

15 Q. So that was 12.7 in state and 15.6 out of state?

16 A. That's right.

17 Q. And now when we go back to 62, that marginal effect is a
18 little bit higher of 12.9 and 15.7 than you just showed?

19 A. That's right. And that tells you, given that they don't
20 change very much, that that's not the primary way through which
21 preferences are operating.

22 Q. And, again, since the numbers are higher when personal
23 quality rating are removed shows your numbers are actually more
24 conservative?

25 A. That's correct.

1 Q. Let's look at the second panel on Slide 62. Hispanic
2 applicants, can you walk through that as well?

3 A. Well, that's going to be the same thing where the first row
4 is going to be the same as what we've seen elsewhere because
5 that's the status quo, and then now we're looking at the
6 probability without racial preferences, and those numbers
7 should be a little bit lower than what we had before so that
8 when you take the difference, the marginal effect of race is
9 higher.

10 Q. So here we have 10.1 percent in state and 14.5 out of
11 state, correct?

12 A. Correct.

13 Q. And if we go back one slide to 61, the Hispanic numbers are
14 in the first panel there, correct --

15 A. Yeah.

16 Q. -- we want to compare it to? And that one in state is
17 what?

18 A. 9.7.

19 Q. And out of state?

20 A. 14.2.

21 Q. So, again, your numbers are more conservative?

22 A. That's correct.

23 Q. Thank you.

24 **MR. MCCARTHY:** Your Honor, that's all I have for
25 Professor Arcidiacono, except for the proffer you said we could

1 make.

2 **THE COURT:** Yes.

3 **MR. MCCARTHY:** May I do that now?

4 **THE COURT:** You may.

5 **MR. MCCARTHY:** Thank you.

6 Q. (By Mr. McCarthy) Professor Arcidiacono, did you work with
7 Mr. Kahlenberg in connection with his race-neutral simulations?

8 A. I did.

9 Q. Did Mr. Kahlenberg give you instructions about what he
10 wanted to simulate in terms of race-neutral alternatives?

11 A. He did.

12 Q. And you handled the modeling?

13 A. I handled executing the simulations according to his
14 instructions.

15 Q. Were most of those simulations based off models that you
16 created to do your expert analysis?

17 A. They were.

18 Q. In some of Mr. Kahlenberg's simulations, he used percentage
19 plans, correct?

20 A. Correct.

21 Q. And how did you accomplish that in the modeling of the
22 simulations?

23 A. Well, there we're going to calculate an admissions index,
24 and it depends on whether you're using applicants alone or also
25 including nonapplicants to rank -- rank -- rank people and then

1 take the top set of people from different schools.

2 Q. At whatever percentage Mr. Kahlenberg instructed you to do?

3 A. That's correct.

4 Q. And in some of his simulations, he employed SES or
5 socioeconomic preferences, correct?

6 A. That's correct.

7 Q. And how did you accomplish that in the modeling?

8 A. Well, some of those variables are already in the data and
9 some are coming from other sources, and then we can add bumps
10 to the coefficients of the model which will affect the
11 admissions index.

12 Q. So these would have been controls or variables in the model
13 that reflected socioeconomic status, and you could adjust the
14 coefficients?

15 A. In some cases, we were adding those in and then putting
16 bumps accordingly.

17 Q. Understood. And Mr. Kahlenberg would direct you as to the
18 size of the bumps?

19 A. That's correct.

20 Q. On a few occasions, Mr. Kahlenberg wanted modified versions
21 of one of Professor Hoxby's simulations, correct?

22 A. Correct.

23 Q. And on those occasions, you would simply adjust
24 Professor Hoxby's models at Mr. Kahlenberg's direction?

25 A. That's correct.

1 **MR. MCCARTHY:** No further questions, Your Honor.

2 **THE COURT:** All right. Thank you.

3 **MR. FITZGERALD:** May I put this up? I just need one
4 moment.

5 **THE COURT:** You may.

6 (Pause in the proceedings.)

7 **MR. FITZGERALD:** Thank you, Your Honor.

8 **THE COURT:** Yes.

9 **CROSS-EXAMINATION**

10 **BY MR. FITZGERALD:**

11 Q. Good morning, Professor Arcidiacono.

12 A. Good morning.

13 Q. Let me apologize in advance. I will slip and call you
14 Mr. Arcidiacono, I'm sure, many times. I'm not trying to take
15 away your Ph.D. So I apologize about it.

16 Now, before we turn to areas where I believe we may
17 disagree, let us see what we can agree upon. I'd like to talk
18 to you about the testimony that you are not offering.

19 In the *Harvard* case, can we agree that in that case you
20 asserted with 99.8 percent confidence that Harvard manipulated
21 its admission process to ensure that the admission rate for
22 African Americans tracked the overall admission rate, correct?

23 A. I'm sorry. What?

24 Q. Did you assert in the *Harvard* case with 99.8 percent
25 confidence that Harvard manipulated its admissions process to

1 ensure that the admissions rate for African Americans tracked
2 the overall admissions rate?

3 A. No, I -- but it is true for single-race African Americans
4 over a particular period of time.

5 Q. And you asserted that Harvard manipulated the admissions
6 process for that group with 99.8 percent confidence?

7 A. Yes.

8 Q. And to be clear for the record, I'm not agreeing with that
9 assertion in this case, just restating what you asserted in the
10 Harvard matter, correct? Understood?

11 A. That's correct.

12 Q. Can we agree that in this case you make no assertion that
13 UNC engaged in such manipulation and racial balancing, correct?

14 A. That's correct.

15 Q. And, in particular, you are not offering any testimony in
16 this case that UNC used the weightless process to affect racial
17 balancing, correct?

18 A. Correct.

19 Q. And yesterday you testified about measures of academic
20 strength. And I'll try to give you topic sentences as I change
21 topics, but forgive me when I don't.

22 When you testified about measures of academic strength, can
23 we agree that you are not offering expert testimony in this
24 case about the proper metrics that should be used to measure
25 academic preparedness? Correct?

1 A. Correct.

2 Q. And you agree that you are not offering testimony in this
3 case about the proper metrics that should be used to measure
4 academic excellence, correct?

5 A. Correct.

6 Q. And we can agree -- and you're not offering testimony about
7 how UNC should evaluate the quality of its admitted students
8 with respect to its overall admission, correct?

9 A. I'm sorry. Can you repeat the question?

10 Q. Yeah. I'll try to put it in English this time, so I
11 apologize.

12 You are not offering testimony here today about how UNC
13 should evaluate the quality of its admitted students, correct?

14 A. Correct.

15 Q. Now, approximately how many hours, ballpark, have you
16 worked on this matter to date?

17 A. A thousand.

18 Q. And part of your work was to review the allegations in the
19 complaint, particularly Count I, correct?

20 A. Correct.

21 Q. And the complaint in Count I implies that the school group
22 review process may have been a pretext to engage in improper
23 racial balancing, correct?

24 A. I'd have to review the complaint.

25 Q. Let me ask you this: You testified yesterday that you are

1 not an opponent of affirmative action, correct?

2 A. Correct.

3 Q. You testified yesterday that you are sometimes a critic of
4 parts of affirmative action, and that a lot of your work is
5 about bringing some nuance to the affirmative action debate; is
6 that right?

7 A. That's correct.

8 Q. Now, let me ask you this since we're addressing your point
9 of view: Is it fair to say that you believe that for many
10 colleges holistic admissions is a lie built into the whole
11 admissions process?

12 A. Is a lie built into the whole admissions process. That
13 seems strong. I think that how college admissions gets talked
14 about is often deceptive based on what I've seen in terms of
15 the actual data.

16 Q. And have you indicated publicly you've come close to saying
17 that your belief is that holistic admissions is a lie?

18 A. I don't remember. It's possible. I don't know.

19 Q. And that's the point of view you bring to a case, is
20 skepticism as to whether or not holistic admissions is genuine?

21 A. Oh, no. That's the result of looking at the two cases.

22 Q. But you believe --

23 A. I mean, I was never in a position to evaluate that
24 statement until these two cases.

25 Q. To be clear, in this case where a school group review is at

1 issue, in your reports and your deposition and your testimony
2 you are offering no opinion here as to whether or not school
3 group review was the mechanism used by UNC to allegedly insert
4 racial preferences into admissions, correct?

5 A. Correct.

6 Q. Now, I'm going to change topics to economic modeling for a
7 moment. I'd like to talk about the process of building and
8 using an economic -- econometric model in the abstract before
9 we talk about this case.

10 Can we agree that the idea of econometrics is to use
11 empirical data to test the theories of how things work?

12 A. Yes.

13 Q. And you want to test things rather than assume them,
14 correct?

15 A. Correct.

16 Q. And, first, an economist frames the question to be
17 answered, correct?

18 A. Correct.

19 Q. So if someone said, What will happen if we tax gasoline?
20 Will people drive less and how much; that's the question
21 hypothetically you would frame, correct?

22 A. Correct.

23 Q. The second thing one does is to gather empirical data,
24 correct?

25 A. Correct.

1 Q. And you focus on observable things, things that you can
2 measure and for which you can obtain those measurements,
3 correct?

4 A. That's correct.

5 Q. And there will be unobservables that one cannot measure or,
6 if they're measured by someone else, you cannot get access to,
7 correct?

8 A. That's correct.

9 Q. And we'll come back to that.

10 And then next you design a model, correct?

11 A. Correct.

12 Q. And the models can have assumptions in them that can be
13 important, correct?

14 A. All models have assumptions, yes.

15 Q. When you constructed your model in this case, did you
16 assume that underrepresented applicants were less compelling
17 than white applicants in unobservable qualities?

18 A. No.

19 Q. And that would be a mistake to do so, would it not?

20 A. So what I would say is that the selection -- if you look at
21 the pattern of the coefficients in my models, they're all
22 increasing. So there would be no reason to believe that those
23 unobservable qualities moved in the other direction.

24 Q. Sir, my question to you was: Would it be a mistake to
25 assume that the unobservable qualities of underrepresented

1 minorities were inferior to whites? Yes or no?

2 A. I don't know how to answer that because it's not part of
3 the model. The model assumes that the unobserved qualities are
4 unrelated to this.

5 Q. Let me go back. You agree with me that you did not assume
6 that underrepresented minorities had lower unobservable
7 qualities, correct?

8 A. That's correct.

9 Q. We'll come back to it.

10 Now, one of the things that you do is analyze the data in
11 an iterative process, correct?

12 A. Analyze the data in a what?

13 Q. An iterative process.

14 A. That's correct.

15 Q. And the questions don't change, correct?

16 A. That's correct.

17 Q. The data you gather don't change, correct?

18 A. Correct.

19 Q. But the models you try out and measure, they may change.
20 That's part of the process, correct?

21 A. That's correct.

22 Q. And will you agree with me that the limitation on any model
23 is that correlation does not mean causation, correct?

24 A. That's correct.

25 Q. And you agree with me that there's a classic example of

1 folks being sick and going to visit a doctor, correct?

2 A. Yes.

3 Q. And the sick people and visiting a doctor are correlated,
4 correct?

5 A. Correct.

6 Q. It doesn't mean that the person got sick because they
7 visited the doctor, correct?

8 A. That's correct.

9 Q. Now, I'd like to talk about observables and unobservables
10 for a moment.

11 Unobservables have the potential to bias a model, correct?

12 A. Correct.

13 Q. And unobservables may or may not be correlated with the
14 observables, correct?

15 A. Well, by assumption they are not correlated with the
16 observables. That's what happens when you're estimating the
17 model. Now, those coefficients can reflect the fact that those
18 unobservables are different across the groups and so can affect
19 those coefficient estimates. That's also why the coefficient
20 estimates change as we add more controls, because we're
21 shifting some things from what were part of the unobservables
22 into the observables.

23 Q. But for the ones that remain unobservable, they may or may
24 not run in the same direction as the observables, correct?

25 A. It's highly unlikely that they're going to run the other

1 direction given the pattern is they're already in the same
2 direction every time we add different sets.

3 Q. We're talking a hypothetical for the moment, correct?
4 We're not talking about your particular model in this
5 particular case yet, correct? Do you understand that?

6 A. I understand that. It's hard for me to answer without
7 being more specific to frame the question.

8 Q. So my question was: The unobservables run in a different
9 direction than observables?

10 A. That is possible.

11 Q. It's possible. Let me give you an example. Let's assume
12 you're looking at people who bike, and you're trying to figure
13 out who are the good bikers, okay. And let's look at -- you're
14 looking across the whole general population. Understood?

15 A. Yep.

16 Q. And assume there's a population of folks who have very nice
17 bikes in the general population. Might there be a correlation
18 that they might be the better bikers either because they bike
19 more or are willing to spend that kind of money on a bike?

20 A. Yes.

21 Q. Now let's change the hypothetical to a different one.
22 Assume you've learned that of this, say, a mass of a thousand
23 bikers, ten bikers finished in the top ten in a race.
24 Understood?

25 A. Yep.

1 Q. And for purposes of this, you know no more about the
2 abilities of the bikers, and suppose you're to learn one
3 observable, the quality of the bike. You found out of the ten
4 bikers who finished in the top ten, five had really expensive,
5 fancy, aerodynamic bikes. Understood?

6 A. Yep.

7 Q. And for the other five, they had the old, heavy, clunky
8 bikes we probably all grew up with. Understood?

9 A. Yep.

10 Q. But unobserved to you, other than the result, the
11 particular biking ability of each biker --

12 (Court reporter requests clarification.)

13 Q. For the ten bikers, you have no other insight into their
14 biking ability. Would you agree with me that the folks who had
15 the old, clunky bikes are much more likely to have higher
16 biking ability, correct?

17 A. No.

18 Q. No. They finished in the top ten with old, clunky bikes
19 compared to the five who finished in the top ten with new,
20 fancy bikes and you don't think --

21 A. If they got the exact same time, then I would infer that.

22 Q. So the --

23 A. The issue there is that we're not talking about everyone
24 who's at the margin. The example you're giving is something
25 that applies great at the margin.

1 If we're talking about the last person admitted and -- the
2 last two people admitted, one of them is stronger on test
3 scores than the other one, then I would agree that the other
4 one is probably stronger on the unobserved parts. But we've
5 seen that that's not true overall.

6 So if you take those ten bikers and they finish in that
7 way, the ones with the five nice bikes, maybe they finished
8 fastest in part because of the bike, but also because they were
9 stronger bikers.

10 Q. So let me just change my hypothetical. The ten bikers
11 finish in a dead heat. Do you agree with me that the five with
12 the old, clunky bikes are much more likely to have a higher
13 biking ability? Correct?

14 A. In that case, yes.

15 Q. And their unobserved ability ran counter to the
16 observables, correct?

17 A. In that example, yes.

18 Q. Now, sir, the nature of the unobservable factors themselves
19 will determine whether they run in the same direction or a
20 different direction as the observables, correct?

21 A. I don't think there's much content to that statement. I
22 mean, the unobservables can run counter to the observables.
23 It's possible and it's -- so by definition, then, I suppose
24 there are going to be some things that would operate that way.

25 Q. So the answer to my question would be yes?

1 A. Yes.

2 Q. Thank you.

3 Now, would you agree that there are unobservables in UNC's
4 admission process, correct?

5 A. Yes.

6 Q. Significant ones, correct?

7 A. Not that significant, considering how accurate the models
8 are.

9 Q. Did you agree with me at deposition that with regard to
10 some of the observables that unobservables do play a role in
11 UNC's admission process?

12 A. Oh, I definitely agree with that.

13 Q. And in some examples, the unobservables are incredibly
14 strong, correct?

15 A. Well, they're -- yes, there will always be some that are
16 incredibly strong in the unobservables.

17 Q. And some of what was unobservable to you was, in fact,
18 observable to the UNC admissions officers, correct?

19 A. Correct.

20 Q. And that would include things about the applicants such as
21 letters of recommendation, correct?

22 A. Correct.

23 Q. And those would be read by the admissions officers before
24 they make the decision, correct?

25 A. Correct.

1 Q. On a prior occasion, you published an article that
2 discussed unobservables in the educational admission process in
3 higher education, correct?

4 A. I'm sorry?

5 Q. Did you publish an article called "Affirmative Action and
6 the Quality-Fit Trade-Off" in 2015?

7 A. That's correct. I think that's 2016, but yeah.

8 Q. Okay. We have the same article in mind?

9 A. Yes.

10 Q. And in that situation, did you look at admissions to
11 business schools? Correct?

12 A. I don't remember. Are you -- there's a paper that I wrote.
13 It's one of the few papers where a selection on observables and
14 unobservables goes the other way.

15 Q. So you'll agree with me that you wrote a paper where in the
16 admissions process observables and unobservables went in
17 opposite directions, correct?

18 A. For one small part of that paper. For the other parts,
19 that was not true.

20 Q. Let's talk about the part where the observables and the
21 unobservables went in the other direction.

22 I'm sorry. I said business schools. I believe it was law
23 schools. So if that threw you off, I apologize.

24 A. No, it actually was business schools.

25 Q. Did you indicate that in those schools they have access to

1 information about students that are unobservable to researchers
2 and that also are likely to affect student (indiscernible).

3 (Court reporter requests clarification.)

4 A. I need you to read it again anyway, so sorry.

5 Q. That the schools have accessed information about students
6 that are unobservable to researchers and that also are likely
7 to affect student applicants.

8 A. Yes.

9 Q. And did you state: "Thus, students who are similar in
10 terms of observables but who go to law schools of different
11 quality likely also differ in terms of their unobserved
12 factors"? Do you recall saying that?

13 A. Well, now we must be shifting examples because I haven't
14 written any papers on law schools. This particular paper
15 you're talking about is a survey paper. I just want to clarify
16 for the discussion, I was talking -- I have a paper about
17 business school students.

18 Are you now talking about something entirely different
19 here?

20 Q. Why don't we pull up DX305 at page -- and, first of all,
21 when we start with -- the paper I was talking about,
22 "Affirmative Action and Quality-Fit Trade-Off" --

23 A. Yeah, this is a working paper version. We got published in
24 2016.

25 Q. Okay. Thanks for clarifying.

1 If we can now go to page 21. And I don't know if the
2 quality of your screen is very good, but does it say there that
3 "law schools have access to information about students that are
4 unobservable to researchers and that also are likely to affect
5 student outcomes"? Do you see that?

6 A. Yeah.

7 Q. And is that part of your working paper?

8 A. Yes.

9 Q. And it indicates here that those students who are similar
10 in terms of observables, but who go to law schools of differing
11 quality, likely also differ in terms of these unobservable
12 factors. Do you see that?

13 A. Yeah. I totally agree with the whole statement.

14 Q. And the students attending more elite law schools have
15 higher unobserved ability. Do you see that?

16 A. Yeah.

17 Q. And in that factual -- in that situation, when the
18 observables ran in the opposite direction, you assume that the
19 reason some folks got into better schools were the unobserved
20 qualities of the applicant, correct?

21 A. So what we're talking about here is two people who had the
22 same LSAT scores, one who went to a better school than the
23 other; and it's likely that, given the same LSAT scores, that
24 person who went to the better school was stronger on the
25 unobservable. That I will agree with.

1 Q. And one thing, just to be clear, you generally think that
2 people who have the same LSAT scores are equally qualified, in
3 your mind?

4 A. What do you mean by that? There are other characteristics
5 of --

6 Q. Withdrawn. Withdrawn.

7 You testified in this case -- and now I'm turning to the
8 UNC models -- that African Americans do well in the personal
9 ratings at UNC, correct?

10 A. Correct.

11 Q. And in the situation where there were unobservables, you
12 have assumed in this case that the unobservables for
13 applicants, including applicants from underrepresented
14 minorities, run in the same direction as the observables,
15 correct?

16 A. No, I assume that they're independent. That's -- when we
17 get coefficients in my model and I interpret those coefficients
18 as measures of racial preferences is because I am assuming that
19 everything else is independent -- the unobservables are
20 independent.

21 Q. And have you stated in your reports that you assume the
22 unobservables and the observables run in the same direction?
23 Yes or no?

24 A. What I am saying -- so there's two aspects to that. What
25 I'm giving is an example of why you might think these are

1 underestimates because we typically think that observables and
2 unobservables run in the same direction. So that means I'm
3 underestimating. If I actually put in that where we had the
4 unobservables be there, then my numbers would be higher. For
5 the purposes of my model --

6 Q. Sir, my question to you is: Did you say that in your
7 report? If Mr. McCarthy wants to ask you on redirect why,
8 that's fine.

9 But I'm just asking you: Did you state in your report that
10 you assumed observables and unobservables run in the same
11 direction?

12 A. I have to clarify the question, though, because when I
13 estimate the model, that's not what I'm doing.

14 Q. I'm asking you whether you wrote in your report -- I'll get
15 to your models --

16 A. Yes, I wrote it in the report. Sorry.

17 Q. Now I want to talk to you about a model's accuracy of
18 predicting an outcome.

19 You gave a lot of testimony yesterday and today about your
20 model's accuracy predicting outcome, correct?

21 A. Correct.

22 Q. Now, would you agree with me that a model's accuracy in
23 predicting an outcome does not indicate that that model
24 accurately measures the coefficient? Yes or no?

25 A. Can -- it's possible that it doesn't accurately measure the

1 coefficient, yes.

2 Q. Let me give you a hypothetical. This is not UNC. There is
3 a school that admits a thousand students a year. Let's assume
4 that hypothetical. And during the process, as they make near
5 final decisions, they have to sort of true-up the size of the
6 class. They don't want too few. They don't want too many.
7 Understand?

8 A. Yes.

9 Q. And if there's a model in the process weighing whatever is
10 important for that school -- SAT, GPA, ZIP code, whatever it
11 is -- they produce a model, and at the end they right-size it.
12 And if they have 1,100 admits and they want 1,000 admits,
13 they'll just do a random lottery and throw 10 percent out.

14 Do you understand that?

15 A. Okay.

16 Q. If you took their provisional decisions and bake that into
17 the model and have the model predict the likelihood of someone
18 getting in, including the tentative decision, the model would
19 be very accurate, correct?

20 A. That's correct.

21 Q. But it wouldn't measure the coefficient of ZIP code, race
22 or SAT score very well, correct?

23 A. In the example that you gave, yes.

24 Q. Thank you.

25 I have one question on overfitting. I think we agree on

1 this, but just to be clear, do you agree with me that your
2 Model 7 is overfit?

3 A. Yes.

4 Q. I'd like to talk to you about the academic index. You
5 testified about your academic index, which is part of your
6 decile analysis, correct?

7 A. Correct.

8 Q. And the academic index is a weighted average of SAT scores
9 and GPA, correct?

10 A. Correct.

11 Q. And you testified in this case and the case brought against
12 Harvard by the same plaintiff, correct?

13 A. Yes.

14 Q. And in that case, you also used an academic index, correct?

15 A. Correct.

16 Q. But Harvard actually calculates an academic index, however
17 it uses it -- but Harvard calculates an academic index because
18 it's part of the Ivy League, correct?

19 A. Correct.

20 Q. And to be clear, UNC is not in the Ivy League, correct?

21 A. Correct.

22 Q. And UNC, as part of its admission process, does not
23 calculate an academic index, correct?

24 A. That's correct.

25 Q. By the way, have you been involved in any way in the

1 lawsuit involving Yale brought by the Department of Justice?

2 A. I have not, though I was flattered that they used the same
3 analysis.

4 Q. Separate and apart from your statistical analysis, you
5 described some narrative analysis, including decile analysis,
6 correct? I think you used the word "descriptive."

7 A. Descriptive analysis, that's correct.

8 Q. You will agree with me that the decile analysis by itself
9 is insufficient to show that the differences of admission rates
10 are the result of racial preferences, correct?

11 A. Correct.

12 Q. Do you agree with me that UNC is a highly selective school?

13 A. I think it is highly selective out of state. I think in
14 state it's not as selective, not as selective as out of state.
15 Still selective.

16 Q. Do you still think UNC as a whole is a highly selective
17 school?

18 A. If you combine out of state and in state, that's
19 reasonable.

20 Q. And let me talk to you briefly about legacy preference.

21 Do you agree with me that the number of underrepresented
22 minorities admitted to UNC is minimally affected by the legacy
23 preference?

24 A. It does not have a big affect, yes.

25 Q. Let me talk to you about the admissions process.

1 Did you indicate yesterday that the UNC admissions process
2 is holistic?

3 A. I did.

4 Q. And do you agree that that's a fair description?

5 A. It is.

6 Q. So any testimony you might offer about the process being
7 formulaic or not is not intended to contradict the fact that
8 the process itself is holistic, correct?

9 A. That's correct.

10 Q. When you say that the admissions process is formulaic, can
11 we agree that you're not offering testimony that any admissions
12 officer was specifically and intentionally following a formula?

13 A. I agree.

14 Q. And some of the charts -- I won't try to find them or
15 describe them -- showing the various different formulas you
16 used would be complete -- completely strange to an admissions
17 officer who didn't sit in on this trial, correct?

18 A. That I don't know.

19 Q. You testified yesterday that you believed the admissions
20 decision is guided by a formula. Do you recall that testimony?

21 A. It's guided by an implicit formula, yes.

22 Q. And just so we're clear, you are not saying that individual
23 decision-makers are paying attention to that formula, correct?

24 A. They are paying attention to the components of that
25 formula, and you could say however you want about how all those

1 things all get put together in their admissions decisions. All
2 I am saying is I can approximate their decisions very well.

3 Q. So your testimony is that you could predict decisions very
4 well, but you're not testifying that anyone told any admissions
5 officer to try to follow that formula, correct?

6 A. Correct.

7 Q. You set a 99 -- I'm sorry. You set a 90 percent prediction
8 rate as a threshold for a process to be considered formulaic,
9 correct?

10 A. I said that, but, you know, I don't know where that exact
11 number is. I think my deposition reflects the fact that -- you
12 know, what that standard is, I'm not sure.

13 Q. That was something you used as a ballpark, correct?

14 A. Correct.

15 Q. I'd next like to talk to you about coefficients. I believe
16 that you have testified that the size of the coefficient in a
17 model should correlate to the importance of the factor it
18 measures, correct?

19 A. I think I said subject to scaling.

20 Q. Yes. Agreed?

21 A. The scaling is important.

22 Q. And explain briefly what you mean by scaling.

23 A. Well, there are a few aspects there, but as an example, you
24 could but the SAT score in at a 1600-point scale, and then the
25 coefficient you get would be very small. But if you divided it

1 by 10,000, then the coefficient would be very big.

2 Q. And when you measured factors -- when you put factors in
3 your model and measured coefficients, did you scale them
4 properly?

5 A. Well, that's -- the scaling doesn't matter for measuring
6 the marginal effects; and when we think about something like
7 race, there's an actual scaling, which is one or zero. Where
8 that matters more for would be something like the SAT scores
9 and all that.

10 Q. So if we look at your Model 4 we had yesterday, I think --
11 I believe you -- I don't know what slide this is, but do you
12 recognize that slide?

13 A. Yes.

14 Q. And if we look over on the right side, we see that you
15 estimated a model coefficient under Spec 4, correct?

16 A. Correct.

17 Q. And Spec 4 and Model 4 are interchangeable, correct?

18 A. That's correct.

19 Q. And your coefficient for African American admits under
20 Spec 4 was 3.542, correct?

21 A. Correct.

22 Q. And if you look down below -- and I believe you mentioned
23 yesterday that the coefficient for being first-generation
24 college was 1.168, correct?

25 A. Correct.

1 Q. And then you compared it to and indicated, I believe -- but
2 correct me if I'm wrong -- that the -- in your view, your model
3 would indicate that it's more important to be African American
4 than a first-generation college applicant, correct?

5 A. That's correct.

6 Q. And then if we look here, there are other variables that
7 interact in this model, correct?

8 A. Correct.

9 Q. And then we're going to go to DX309, and I don't know -- is
10 that a printout from the backup materials that you used to
11 calculate these coefficients?

12 A. I don't know. It looks sort of like it might be, given
13 that the 3.542 I think matches the number that you showed me
14 before.

15 Q. Yes. And if you look for first-generation college, if you
16 go down below, you'll see 1.168. We'll highlight that.

17 If I represent to you it's a printout from -- of your
18 model, does that appear to be consistent with the coefficient
19 that you saw? It's from the backup materials you provided.

20 A. Yeah. I mean, we produced those two years ago, so I'll do
21 my best.

22 Q. Okay. If we could look now at what's called "1 of Rank
23 Type 01" on page 2. And do you recall that that is the
24 coefficient for an irregular rank type? Do you recognize that
25 indicator?

1 A. Yeah. Yes.

2 Q. And would that indicate that that's for an applicant who
3 went to a school and had an irregular rank? Correct?

4 A. That's correct. There's a difference here, though, which
5 is quite important. All those people have ranks that -- that I
6 believe are zero in that case, and so you -- I would have to go
7 back and look at it. Anytime you're dealing with missings, it
8 depends on what the baseline is. That's not what you have when
9 you have African Americans and Hispanics. You can't do that
10 comparison.

11 Q. You'll agree with me that the number here indicates a 3.595
12 for the coefficient of irregular rank type?

13 A. I agree with that.

14 Q. Do you agree with me also that the coefficient -- that
15 there are other coefficients --

16 **MR. FITZGERALD:** Can we show the performance rating?

17 Q. (By Mr. Fitzgerald) Do you see the preference ratings 8
18 and 9?

19 A. I do.

20 Q. And do you understand that correlates with people who get
21 performance ratings, applicants, of either an 8 or a 9?

22 A. Yeah. I'd just like to raise the same issue, that it
23 really matters what the baseline is; and the fact is here the
24 baseline is relative to someone who got the "5" on their
25 performance rating. I could have actually made that

1 coefficient go up a lot more if I used the zero -- I'm sorry --
2 "1" on the performance rating because you can see the other
3 coefficients are negative there. So that's all about -- it's
4 all about how those comparisons are relative to the baseline
5 category.

6 Q. Can we agree with this: You can do things with models to
7 make the coefficients go up and down? Correct?

8 A. It depends on the coefficients. You can't do that unless
9 you did it in a really bizarre way with regard to race. Here
10 on the performance measures, you always can choose -- you have
11 to choose one group to normalize the coefficient to be zero.

12 Q. Now I'm going to turn to what the question is.

13 Would you agree with me that the question in this case for
14 Count I is whether race is the dominant factor in the
15 admissions process?

16 A. Whether race is --

17 Q. The dominant factor --

18 A. -- a dominant factor in the admissions process.

19 Q. The dominant factor in the admissions process.

20 A. No, it's a dominant factor in the admissions process.

21 Q. So your belief is the question is whether or not race is a
22 dominant factor in the admissions process?

23 A. I mean, it's a dominant factor for many applicants, but so
24 are other things as well.

25 Q. And you have not testified as to whether or not there are

1 other factors that are more important, correct?

2 A. I mean, I'm happy to testify that unless you get, you know,
3 above 400 on the SAT, you're not getting in. You know, there's
4 obviously lots of other factors that are going on here. What
5 I'm testifying on is when you remove racial preferences, how
6 much do things change.

7 Q. Will you agree with me that, according to your model, if
8 you measured the impact of SAT scores on admissions decisions,
9 that would have a stronger impact than race?

10 A. I'm not sure exactly how to do that.

11 Q. You don't know how to measure for the impact of SAT scores
12 on admissions decisions?

13 A. Well, I know what the coefficient is on that, but what are
14 we talking about doing? Like, are we talking about saying how
15 much admissions decisions would change if we moved your SAT
16 score from what to what? That's the only way I can evaluate
17 the statement.

18 Q. You don't have the ability as an economist to tell us
19 whether or not getting high SAT scores has greater correlation
20 with the admissions outcome than race? Is that your testimony?

21 A. There's not an actual way to measure that. When we're
22 talking about race, we're talking about something that's zero
23 and 1, so here -- in order to do that sort of comparison, I
24 would need to say how would that compare for moving from, say,
25 an SAT score from 800 to 1600 or something like that. So when

1 Professor Hoxby calculates this, she sets all the SAT scores to
2 zero. That's not right, but I don't know how, you know --

3 Q. Did you make any effort to try to determine whether or not
4 SATs and grades were a more important factor in the admissions
5 process than race? A simple yes or no, please.

6 A. No.

7 Q. Now, let's discuss the difference in terminology between a
8 dominant factor and a determinative factor.

9 Do the two words mean something different to you?

10 A. A little bit.

11 Q. Then for this purpose, I'm going to take dominant and
12 predominant, and we'll use those interchangeably. Can we agree
13 on that?

14 A. Sure.

15 Q. And would you agree that showing that something is the
16 dominant factor is harder than showing it as a determinative
17 factor?

18 A. Yes.

19 Q. And let me give you an example. Suppose there was a
20 hypothetical school unlike UNC. Let's assume that the school
21 was entirely one dimensional and focus on that. The school's
22 admissions officers didn't care about verbal scores; they
23 didn't care about athletics, leadership. If the applicant
24 cured cancer, they don't really want to know. They just want
25 the SAT score from them.

1 Now, let's assume that for that class all they cared about
2 was the math score, and anyone who applied who got an 800 on
3 the SAT math score is admitted, and let's assume that anyone
4 who got a 780 or lower on the math score is denied.

5 Do you understand?

6 A. Yeah.

7 Q. And then, because they had more than enough seats after
8 they let in all the folks with 800 scores, they turned to the
9 people who scored 790, and they had 100 seats left and there
10 were 200 applicants with a 790. Understood?

11 A. Yeah.

12 Q. And for those folks, they flipped a coin. They just said
13 800, you're in; 780 or below, you're out; and 790, you took the
14 exam, you flipped the coin and heads, you're in. Understood?

15 A. Yep.

16 Q. For all the applicants with scores of 800, the SAT score
17 was the dominant factor, correct?

18 A. Correct.

19 Q. It was also a determinative factor, correct?

20 A. Correct.

21 Q. And for all the folks who scored 780 or below, SAT was the
22 dominant factor, correct?

23 A. Correct.

24 Q. And it was also a determinative factor, correct?

25 A. Correct.

1 Q. And for the folks who scored 790, the SAT would be the
2 dominant factor, correct?

3 A. Yes.

4 Q. And the coin flip would be determinative, correct?

5 A. Correct.

6 Q. Sir, as I think we're both -- Professor, as I think we're
7 both keenly aware, neither you nor I will determine what the
8 law is in this case. Judge Biggs will decide that, of course.
9 But I want to understand your state of mind as you prepared
10 reports and gave your testimony.

11 Do you understand whether it makes a difference under the
12 law whether a factor is dominant versus determinative for
13 purposes of this case?

14 A. I do not.

15 Q. Do you recall how you --

16 A. Well, actually, I want to take that back because you can
17 have very small racial preferences, and that would be
18 determinative for, obviously, the person right on the margin,
19 and then I would not say it was dominant. A dominant factor
20 would be that it has to be a much larger group.

21 Q. So you would agree with me that the dominant factor test is
22 a much harder test than a determinative factor test, correct?

23 A. Well, yeah, because any racial preferences would be
24 determinative for some people.

25 Q. Now, do you recall how you framed the relevant question you

1 were to address in your initial expert report in January 2018?

2 A. No, I don't.

3 Q. And can we pull up -- you started out with your first
4 report saying the question that you were to address is whether
5 race is a predominant factor in UNC's admissions process. That
6 was your assignment as you described it in your first report,
7 correct?

8 A. Correct.

9 Q. Do you recall how you described your assignment in your
10 second report in April 2018?

11 A. No.

12 **MR. FITZGERALD:** And if we could pull up that report,
13 the question here on page 4.

14 Q. (By Mr. Fitzgerald) You discussed dominant factor in
15 April?

16 A. That's right.

17 Q. Can we turn to your June 2018, your final report, and how
18 you framed your assignment? Did you change your standard in
19 your final report to whether or not race was a determinative
20 factor?

21 A. So to clarify, determinative for many would be dominant.
22 Determinative -- you can be determinative without it being
23 dominant, and this clearly says determinative for many African
24 Americans and Hispanics. So that's just a word choice thing.

25 Q. Let's go back to the first one. Your January report -- if

1 we could pull it up, PX117 -- asked whether -- "Is race a
2 predominant factor in UNC's admissions process?" correct?

3 A. Correct.

4 Q. In your third report, "dominant" became "determinative" and
5 "admissions process" became "decisions," correct?

6 A. I'm using these -- "determinative" for many -- that's the
7 key -- because if it was small, it could be determinative
8 without being dominant. In my mind, these are all words for
9 saying the same thing.

10 Q. So let me ask you this: Do you agree with me that you
11 changed from "dominant" to "determinative" in your third
12 report? Correct?

13 A. I agree that I changed from "dominant" to "determinative"
14 for many.

15 Q. And you agree with me you changed from "admissions process"
16 to "many decisions" in your third report?

17 A. I see those things as being the same, but yes.

18 Q. Were you trying to change the standard as you went from
19 report to report to report?

20 A. No, I was definitely not trying to change the standard.

21 Q. Now, you talked today about whether or not the important
22 question is whether we assess decisions via a person who is an
23 applicant versus the whole pool. Do you recall that?

24 A. Correct.

25 Q. You gave the example of the basketball recruit for whom the

1 fact that the coach wants that recruit on the team could be
2 determinative for him or her, correct?

3 A. Correct.

4 Q. But as to the overall process of 45,000 applicants and all
5 those decisions, the fact of one person being a recruit to a D1
6 basketball team doesn't appear as being as important in the
7 process, correct?

8 A. Yes.

9 Q. Do you agree with me that if you were looking to figure out
10 in the overall process what role a factor played, a Shapley
11 decomposition would be a proper way to do it?

12 A. It depends on what you mean by the overall process. To me,
13 if I think about that basketball example, the difference
14 between dominant and determinative would be if all of them are
15 getting in, that's a dominant factor for the basketball team.
16 That, to me, is the question I'm answering. I don't think it's
17 possible for racial preferences for a minority group to be
18 dominant for the whole process, just almost by the definition
19 of minority.

20 Q. So you'll agree with me that based upon this record if the
21 question before the Court is whether or not race is a dominant
22 factor across the entire admissions process, the answer would
23 be no, correct?

24 A. It depends on what we're characterizing by "the entire
25 admissions process."

1 Q. I'm saying the entire admissions process is all the people
2 who applied. You would agree with me if "the entire admissions
3 process" means all the people who applied to be admitted or
4 denied -- if you look at that process, you will agree with me
5 that race is not the dominant factor in that process for UNC?

6 A. I can say that I agree, but I would have to clarify that of
7 course it's not a dominant factor for white students, you know.
8 So I don't know what that --

9 Q. I'm asking you across the whole process.

10 A. Like you said, across the whole process means people of all
11 races and such.

12 Q. You agree with me --

13 A. And so it's a dominant factor for minority students in
14 terms of their chances of admissions, but when we're talking
15 about the whole process and we're including all the white
16 applicants and everybody else, there's -- it's the analogy to
17 the basketball. Basketball is not a dominant factor if we're
18 going to define it in the way you are defining it. It would be
19 impossible for it to be a dominant factor.

20 Q. So you will agree with me that across the whole process of
21 admissions, considering all races, race is not the dominant
22 factor?

23 A. Yes.

24 Q. Thank you.

25 Now, sir, in your rebuttal report, you did an analysis of

1 shares, correct?

2 A. I did.

3 Q. And that is found in Table 3.3 of your April report, I
4 believe, and we'll pull that up.

5 And if we look over here, this is your estimate of the
6 share of admissions for an -- so I'm looking at the far right
7 column that says "Share Due to Racial Preferences," and in
8 state under the African American line, it goes from left to
9 right until you end up with a number that says 41.7 percent,
10 correct?

11 A. Correct.

12 Q. And that indicates that you attribute 41.7 percent of
13 admissions to racial preferences, correct?

14 A. I'm saying given the characteristics of the applicants --
15 and it's true you have to say "given the other characteristics
16 of applicants" -- the share who are being admitted as a result
17 of racial preferences is 41.7 percent.

18 Q. Now, you'll agree with me that when you measured the share
19 due to racial preferences, you did not also measure the share
20 of admissions due to gender, due to test scores, due to grades,
21 due to other factors, correct?

22 A. All I'm doing is saying what happens when we turn off the
23 effects of race, correct.

24 Q. And similarly, for the out-of-state African American
25 applicants, you'll see in the right column the share attributed

1 to racial preferences to be 91.1 percent, correct?

2 A. Correct.

3 Q. And will you agree with me that you agreed at the
4 deposition that you don't know what the 91.1 percent adds up to
5 if you include the shares of all other factors?

6 A. What I said in my deposition -- and it applies here as
7 well -- is that it depends on the order that you do things. So
8 you can have it all add up to one if you start with race and
9 then keep pulling levers. It doesn't make any sense to pull
10 one race -- one lever, and then put it back in and pull another
11 lever. That's just not a valid way of proceeding.

12 Q. Would you agree with me that the 91.1 percent is not 91.1
13 out of 100? It could be 91.1 out of a lower number or a higher
14 number, correct, depending on how you do it?

15 A. We're talking about an entirely different exercise. I
16 think this is why I didn't use share in my trial testimony,
17 because I didn't want it confused as to what I was doing. All
18 I am doing is turning off the effects of race and seeing how
19 many fewer were admitted.

20 Q. And just so we're clear, if you took a number for share due
21 to racial preferences -- let's call it 91.1 -- if you took a
22 share due to gender preferences and you came up with a
23 different number -- we'll call it X -- and you took shares due
24 to other factor like first-generation college and you called it
25 Y, do you understand -- and I believe you would agree with me

1 that if you took 91.1 plus X plus Y and other factors, that
2 could add up to more than 100, correct?

3 A. Of course.

4 Q. And you are aware in this case that Professor Hoxby
5 calculated that in the case of the statistic on the bottom
6 where it reflects 91.1 percent share for African Americans and
7 70.2 percent for Hispanics, that the total number of shares
8 added up to 543?

9 A. I agree that that's what she did, and what she did was not
10 correct.

11 Q. It's not 91.1 out of 100, is it, sir?

12 A. It most certainly is 91.1 out of 100. It's just what --
13 we're doing different exercises. I'm talking about this 91.1
14 applies to the exercise that I'm doing, not some separate
15 exercise.

16 Q. But was your report intended to convey that race was
17 accounting for the admissions decision for 91.1 out of 100
18 reasons?

19 A. What my report intended to show was that given UNC's
20 admissions process and given the characteristics of those
21 underrepresented minorities applicants -- we're taking all that
22 as given -- if you turned off racial preferences, the admission
23 rate would fall to 1 1/2 percent out of state. That means that
24 91.1 percent, given everything else, was due to race. Now, we
25 could do other exercises, but that's the exercise that we're

1 doing. We're just saying what would happen if we shut off
2 racial preferences. That's all.

3 Q. The 91.1 percent does not reflect the fact that there are
4 other factors out there that could contribute to the admissions
5 decision, according to your model, and the influence of those
6 factors would add up to a total of more than 100, correct?

7 A. Well, I want to break that out because the first part of
8 your statement I disagree with. We're taking their
9 characteristics there. They have certain SAT scores. They
10 have certain grades and so on. Then if you want to do some
11 alternative exercise where we look at changes in that as well,
12 that's a different exercise that I have nothing to say about.

13 Q. And if we did all those exercises, we might find out that
14 91.1 percent of the admissions decisions are due to race or we
15 might find out that 50 percent are due to something else and
16 40 percent are due to something else, and the grand total of
17 what all the factors contributed to the admissions decision
18 would add up to 543 percent, not 100 percent, correct?

19 A. I would still disagree with that because, you know, if you
20 think about what she does to get those numbers, she sets
21 everybody's SAT scores to zero, which is not even a valid score
22 on the SAT. So that exercise -- she's doing that exercise
23 incorrectly, one; and, two, it's not the exercise that I'm
24 doing. I would agree that if we're going to pull different
25 levers at the same time, then you can get a different answer.

1 I'm talking about pulling one lever, given the characteristics
2 of the applicants.

3 Q. I'm going to ask you not about Professor Hoxby's model.

4 A. Well, you gave me 500-some percent. That's from her.

5 Q. I'm asking you: When you refer to 91.1 percent, you
6 understood that if you had calculated the share due to other
7 factors, four other factors, the total shares, when you added
8 up the 91.1 percent and the other factors, could be over 100,
9 correct?

10 A. This is a conditional analysis. What you're talking about
11 is something broader than that, and that would be correct for
12 that broader analysis.

13 Q. And you said before you did not testify about that today, I
14 think, because you were afraid it would be misleading. Is that
15 what you said?

16 A. I did not call it share because I didn't want it to be
17 misleading, but all those marginal effect graphs had those
18 numbers in there.

19 Q. And if it was measured as 91.1 out of 543, that would be
20 17 percent, would it not?

21 A. I'm sorry. Now you're throwing out -- what?

22 Q. If the total of shares of all different factors added up to
23 543, then the proportion that you attribute to race would be
24 17 percent, not 91 percent, correct?

25 A. So if we do something crazy to change the base, then, yes,

1 the number will change to that, but that's what -- yes.

2 Q. If you account for all the different factors that might
3 play into an admissions decision and try to do something crazy,
4 which is, like, see if the percentages can add up to 100, that
5 91.1 percent would become 17, correct?

6 A. So the 17 is based on faulty calculations beforehand, and I
7 don't think that that is ever how you would do a decomposition.
8 You don't pull one lever and put everything back in and pull
9 another lever.

10 Q. Do you agree with me that 91.1 out of 543 is approximately
11 17 percent, ballpark?

12 A. Sure.

13 Q. Thank you.

14 **MR. FITZGERALD:** Your Honor, this might be a good time
15 to break for lunch.

16 **THE COURT:** All right. Let us take a recess, and we
17 will resume at 1:30.

18 (A noon recess was taken from 12:30 p.m. until 1:30 p.m.;
19 all parties present.)

20 **THE COURT:** Yes, sir. You may resume.

21 **MR. FITZGERALD:** Thank you, Your Honor.

22 Q. (By Mr. Fitzgerald) Now, Professor Arcidiacono, I'm going
23 to talk briefly about SAT scores. Your model relies in part on
24 SAT scores, correct?

25 A. Correct.

1 Q. And if there is implicit bias -- if there's implicit bias
2 for the SAT or ACT exams in terms of accurately measuring
3 academic ability, your models do not account for that, correct?

4 A. That's correct. I do not believe that to be the case based
5 on my past research.

6 Q. Sir, can we have an understanding that I will ask the
7 questions and you will answer the question? Correct?

8 A. I'm just telling the whole truth.

9 **THE COURT:** Wait just a minute. I will direct the
10 witness.

11 **MR. FITZGERALD:** I'm sorry.

12 **THE COURT:** If you need some help with the witness,
13 direct your comments to me, and I will direct the witness.

14 **MR. FITZGERALD:** Yes, Your Honor.

15 **THE COURT:** All right.

16 **MR. FITZGERALD:** Your Honor, I'd move to strike his
17 answer because in depositions at his earlier testimony, he
18 committed that he would not be opining on the proper measures
19 of how to assess academic ability. I asked him the
20 hypothetical question that if there's implicit bias in the SAT,
21 would that be reflected in this modeling. He answered the
22 question and then added the opinion I didn't ask for and which
23 he committed not to give as part of his expert testimony. So I
24 would ask the latter part of his answer be stricken.

25 **MR. MCCARTHY:** Your Honor, the witness should be

1 allowed to answer the question as best he can.

2 **THE COURT:** And I agree with that. I think he ought
3 to be allowed to answer the question, and if he needs to in
4 some way elaborate on his answer -- sir, I'm going to ask you
5 if you need to elaborate on your answer, just take your
6 direction from me.

7 **THE WITNESS:** Okay. Thank you.

8 **THE COURT:** All right. Yes, sir.

9 **MR. FITZGERALD:** Thank you, Your Honor.

10 Q. (By Mr. Fitzgerald) Now, as I understand it,
11 Professor Arcidiacono, when you created your model, you tried
12 to model the process the admissions counselors followed,
13 correct?

14 A. I tried to develop a model that approximates that process,
15 yes.

16 Q. And one of the factors -- or lots of the factors that you
17 try to capture in your model are the things that the admissions
18 officers saw, correct?

19 A. Correct.

20 Q. So one thing that the admissions officers look at is SAT
21 scores, correct?

22 A. Correct.

23 Q. Another thing that the admissions officers look at are ACT
24 scores, correct?

25 A. Correct.

1 Q. Another thing the admissions officers look at is high
2 school GPA, correct?

3 A. Correct.

4 Q. With regard to standardized tests -- let me just stop there
5 and put before you Defense Exhibit 500.

6 **MR. FITZGERALD:** Or, actually, go to the other page.

7 Q. (By Mr. Fitzgerald) I realize this is not a proportional
8 graph, but does this show the various things that might be
9 available for a reader to look at, including missing fee
10 waiver, that sort of stuff?

11 A. So there's an issue about how to think about those missing
12 things. The question is do they see it and I just don't have
13 it in the data, or do they not see it and have figured out
14 another way of getting at it through the other channels. So
15 that's -- I don't know the answer to that.

16 Q. Fair enough. So on things that they may or may not see,
17 let's put that to the side. Your model wants to approximate
18 what they actually see, correct?

19 A. Yes.

20 Q. And where you have it, if you saw a GPA, if it wasn't
21 missing, you would put the actual GPA in to reflect what the
22 admissions officer sees, correct?

23 A. That's correct.

24 Q. Now, some students take the SAT but not the ACT, correct?

25 A. Correct.

1 Q. And some students take the ACT but not the SAT, correct?

2 A. Correct.

3 Q. And, in fact, you understand that the North Carolina public
4 school students are required to take the ACT in their junior
5 year, correct?

6 A. Actually, I did not know that, but...

7 Q. And then some students take both the SAT and the ACT,
8 correct?

9 A. Correct.

10 Q. And some students may take either test more than once,
11 correct?

12 A. Correct.

13 Q. And if a student took the SAT twice, you understand that
14 UNC would use the highest score for each component, correct?

15 A. It's been a while, so I don't really remember. But I would
16 assume that's the case, yes.

17 Q. And do you understand that if an applicant only took the
18 ACT, that UNC converted the ACT score into an SAT score,
19 correct?

20 A. I'm actually not sure how they dealt with that.

21 Q. And you understand that you have an apples-to-oranges
22 problem if an admissions offer is looking at one applicant
23 whose score is an ACT and another applicant whose score is an
24 SAT, correct?

25 A. Correct. And I think that's true also because of the

1 different sections on those exams.

2 Q. And do you agree with me that the College Board, who I
3 think produces the SAT, and the folks who produce the ACT
4 publish a concordance table each year? Is that correct?

5 A. That's correct.

6 Q. What that would do -- and I'm making up these numbers; I'm
7 not following a concordance table -- is they said that an SAT
8 this year that results in a score of 32 will be treated like an
9 SAT score of 1300, correct?

10 A. That's correct.

11 Q. So that an admissions officer would no longer have to look
12 at a 32 and a 1300 and wonder how they compare. They would be
13 looking at two 1300s once it's converted, correct?

14 A. Correct.

15 Q. And UNC followed that process of translating an ACT score
16 to an SAT score without regard to race, correct?

17 A. That's correct.

18 Q. You did something different, didn't you, sir?

19 A. I did it both ways, but my preferred model I did it the --
20 a different way.

21 Q. And in your preferred model, you broke it down by
22 component, correct?

23 A. That's correct.

24 Q. And you also broke it down by race, correct? You gave
25 different credit to students based upon their ACT score

1 | depending on whether or not they were white, black, Hispanic or
2 | Native American, correct?

3 | A. I predicted their ACT scores using lots of information,
4 | including race. So from that perspective, correct. But I also
5 | did other models where I did not do that, and it did not change
6 | my findings.

7 | Q. So I'm going to ask you about what your preferred model
8 | did, and let me give you a hypothetical. Assume there are
9 | three applicants named Joe. One Joe happens to be white, one
10 | Joe happens to be Hispanic, and one Joe happens to be black,
11 | okay. Now assume that each of the three applicants go in and
12 | take the ACT test on the same day.

13 | Understood?

14 | A. Yeah.

15 | Q. Now assume that each of the three Joes -- one white, one
16 | black, and one Hispanic -- answer all the questions identical.
17 | They each get the same right answers. They each get the same
18 | wrong answers.

19 | Do you have that?

20 | A. I do.

21 | Q. And they end up with the exact same ACT score, correct?

22 | A. Correct.

23 | Q. In the UNC process of what admissions officers see, that
24 | admissions officer, if they were looking at a screen with
25 | applicant one, Joe who happens to be white; applicant two, Joe

1 | who happens to be black; applicant three, Joe who happens to be
2 | Hispanic, they would see the identical ACT score as converted,
3 | correct?

4 | A. That's correct.

5 | Q. Now, I'm going to ask you to look at DX311 on your screen,
6 | 311E. If you can take a look at that. I'll tell you the
7 | question while you are looking at it so you know what's coming.

8 | Is this a printout of the log file generated when you run
9 | the code you used to clean the UNC applicant data? And if it
10 | helps, I think the code file is up at the top,
11 | UNCcleaner4N.log.

12 | A. Well, I clearly didn't produce this log file. I would have
13 | to see more information to know whether it's an accurate
14 | representation of it, but I'm happy to proceed as though it
15 | was.

16 | Q. Sure. And if need be, we brought a computer, and we could
17 | run you a log file for you -- it would take 10 minutes -- if
18 | you want to verify it. I will represent to you this is a
19 | printout of the log file that you produced to us.

20 | A. Okay.

21 | Q. And is this in part the code that does the conversion from
22 | ACT scores into SAT verbal and math scores that your model
23 | runs?

24 | A. I can't tell because I can't see what else is on the
25 | screen. I'm not sure when we convert it -- converted it.

1 Q. Do you want to look at more of the first pages, or do you
2 want me to direct you to the relevant section?

3 A. Well, I mean, I -- I'm not seeing in the code where I'm
4 doing this, so I don't -- I don't know.

5 Q. Let me direct us to page 84 and 85 of DX311E, and you see
6 the highlighted -- and we added the highlight so you could find
7 it -- SAT verbal 2018. Do you see that?

8 A. Yeah.

9 Q. Is that what you did in 2018 to take an ACT score and
10 convert it into separate SAT verbal scores and then later
11 separate math scores?

12 A. Honestly, I don't remember. I would have to look at the
13 code to know how those things were constructed.

14 Q. So we can let you look later to run your own program, but
15 let me represent for the moment that this was printed out off
16 your program.

17 Would the bottom half of the page reflect the adjustments
18 made to the SAT score when it was converted from -- a score
19 when it was converted from an ACT to an SAT score?

20 A. I can't tell by looking at this code. Can you scroll a
21 little bit further down on the top one?

22 (Mr. Shorr complied with the request.)

23 A. Yeah. I'm sorry. I cannot tell from the code. I mean,
24 it's possible, but I can't -- I can't tell. Actually, scroll
25 up on that one.

1 (Mr. Shorr complied with the request.)

2 A. No, because it's not saying what the regression is, so I --
3 yeah. I'm sorry. I don't know. Unless I see the command as
4 to what it's running, then I don't -- I don't know.

5 Q. We have the model loaded on the computer. It takes 10
6 minutes to run. Would you like to run it?

7 A. It's not an issue about running it. I need to see the --
8 in order for me to tell you that this is what is -- what the
9 output of this is, I have to see the code that did the
10 regression. I mean, we can operate under the premise that that
11 is, but --

12 Q. Sure.

13 A. -- that would be all -- I mean, that's all -- I just don't
14 know. I'm sorry.

15 Q. So why don't we operate on that premise, and we'll give you
16 an opportunity to --

17 **MR. FITZGERALD:** Your Honor, if that's okay. We would
18 give him an opportunity to verify that this is, in fact, a
19 program generated by his code.

20 **THE COURT:** You're going to give him an opportunity to
21 verify it?

22 **MR. FITZGERALD:** Afterward, just to make sure -- we
23 can give him the computer at a break and run it and make sure
24 that we haven't done it wrong, but we have done it with the
25 materials that were provided to us.

1 **THE COURT:** Let me hear from you.

2 **MR. MCCARTHY:** We're willing to allow the testimony to
3 proceed if it's conditional on his ability to confirm that it's
4 the proper code.

5 **THE COURT:** All right.

6 **MR. FITZGERALD:** Thank you, Your Honor.

7 Thank you, Counsel.

8 **THE COURT:** Yes.

9 **MR. FITZGERALD:** Just so the record is clear, from
10 this point forward, this is all conditioned on him being able
11 to check to make sure that we haven't done something wrong. I
12 can tell you we haven't tried to. It doesn't mean we didn't.
13 And with that -- and we did send copies to counsel beforehand,
14 but we'll let him have a break and we have a computer with the
15 model on it.

16 **THE COURT:** All right.

17 Q. (By Mr. Fitzgerald) Assuming those conditions, sir, if you
18 look down to the bottom of the page, when it says "SAT verbal,"
19 sort of a column and coefficient, does that indicate that when
20 the identical ACT score was converted to an SAT score in your
21 model that minus 8.1 -- so 8.109797 points were deducted for
22 the applicant being black?

23 A. So it's more complicated than that. That does not mean
24 that the conversion is disfavoring black applicants, and the
25 reason for that is that's your regression that's going to

1 weight all these different factors. So to the extent that
2 African Americans are getting lower ACT scores, but that's a
3 noisy measure, we're also including that in this regression.
4 And that coefficient is attenuated, so the mapping is not as
5 clear.

6 And that's why I actually do it both ways in my model, both
7 using these imputations and I also used Professor Hoxby's way
8 where we used the concordance table; and it really doesn't
9 change my findings.

10 Q. I would like to focus my questions specifically on how you
11 did it in your preferred model. Do you understand that?

12 A. Yes. And I'm saying it's more complicated than that
13 because of the -- it doesn't mean it ends up disfavoring black
14 students in here because the distribution of ACT scores is
15 different for black students than white students.

16 Q. Let me frame this question, sir. In this hypothetical,
17 there are two students named Joe, one white, one black. They
18 got the identical score on the ACT test. When the white
19 applicant in your model would get -- let's say 1300 is the SAT
20 score. The black applicant would have 8.1 points lower score
21 given for his SAT verbal than a white applicant, correct?

22 A. That's correct.

23 Q. And then continuing down this list on the verbal score,
24 when an Hispanic applicant scored exactly the same on the ACT
25 score, when his score was converted to an SAT score --

1 A. Even then I want to take that back because I need -- you
2 have to show me all the coefficients in the regression because
3 I don't -- there may be other -- other variables in there as
4 well, interactions and such. I don't know without seeing the
5 rest.

6 Q. Let's cover this part, and then you can look to see for
7 others. But for the SAT verbal, the Hispanic applicant would
8 have 3.36 points deducted from his SAT score, correct, at that
9 stage in the process?

10 A. All else equal, yes.

11 Q. And then for the Asian American applicant scoring exactly
12 the same on the ACT test, he or she would have a minus 1
13 point -- would have 1.4 points deducted, correct?

14 A. Correct. This is on a 1600 point -- well, 800-point scale,
15 yes.

16 Q. And then for an applicant who's identified here as American
17 Indian, for scoring exactly the same on the ACT, that applicant
18 would be given 5.6 points lower, correct?

19 A. Correct.

20 Q. And then for someone who was a Hawaiian or Pacific Islander
21 heritage, for scoring exactly the same thing on the ACT, he or
22 she would receive more than 24 points lower score in your
23 model, correct?

24 A. Correct.

25 Q. Even though the admissions officer would see exactly the

1 same score as he or she looked at it, correct?

2 A. The admissions officer would see all the components of the
3 score.

4 Q. And the admissions officer would not see a score that had a
5 penalty of minus 24 on the SAT verbal for being Hawaiian,
6 correct?

7 A. The admissions officer would see all the ACT components of
8 the score and then do with that information whatever they
9 wanted to do.

10 Q. If you understood that the admissions officer was given a
11 concordance table or concordance program that converted the ACT
12 score into a number, let's call it 1300, you know, they would
13 see 1300 for a white applicant, they would see 1300 for a
14 Hawaiian applicant, but your model had 1300 for the white
15 applicant and 1276 for the Hawaiian applicant, correct?

16 A. I don't think that's all they would see.

17 Q. They would see those numbers for the SAT score, correct?

18 A. And they would see what they got on the components of the
19 score.

20 Q. But if they had converted apples to apples to an SAT score,
21 the SAT score that would appear on the page the admissions
22 officer --

23 A. I'm agreeing they see that score. I'm saying that they see
24 more information than just that score.

25 Q. I recognize that. I'm asking you with regard to the SAT

1 score, they would see a score 24 points lower for
2 Hawaiian/Pacific Islander on the verbal, correct?

3 A. I -- I -- no. I'm sorry. I don't understand the question.
4 They would not see a score of 24 points lower. If they're not
5 even showing the SAT verbal score for this applicant, all they
6 would see on the concordance table would be the total score,
7 and then they would see the ACT subcomponents.

8 Q. Let me make it clear, then, if I misstated it. The
9 admissions officer is going to see the exact same score on SAT
10 without regard to race whenever the applicant scored the same
11 ACT score, correct?

12 A. That's correct.

13 Q. Your model is inputting for what the admissions officer
14 sees, a lower SAT verbal score for Pacific Islander after 24
15 points are deducted, correct?

16 A. I think that that's a mischaracterization because there's
17 much more information that I'm incorporating into that
18 imputation. When you just use the SAT score, that is as if the
19 admissions officer does not see the subcomponents of either the
20 SAT and the ACT, and that's the sort of information that I'm
21 incorporating.

22 Q. And if the admission -- but you're treating a white
23 applicant who gets the exact same score and subscore in your
24 model differently than a black or Hispanic or Native American
25 applicant who scores the exact same subscores and scores,

1 correct?

2 A. I'm doing the same thing that I did on the GPAs. There's
3 more information to be inferred than just from that score.

4 Q. Is the answer to my question yes?

5 A. You have to repeat the question. I'm sorry.

6 Q. I'm saying if a white applicant, a black applicant, and an
7 Hispanic applicant score identical on the scores on ACT and
8 subscores, your model is going to input the converted ACT score
9 for verbal differently by race and mark down the Hawaii/Pacific
10 Islander score --

11 A. It is going to do that differently by race. It is not
12 clear that that disfavors those groups.

13 Q. Sir, if you're a Hawaii/Pacific Islander, would you rather
14 have a 1300 or a 1276?

15 A. That's not the right comparison, and the reason it's not
16 the right comparison is because of how the conversion works in
17 this regression from ACT scores to SAT scores. That's -- if it
18 was a one-to-one trade-off, then you would be right, but that's
19 not -- what's happening here is we're getting regression
20 towards the mean.

21 What this means is that it could be that for lower
22 scores -- lower ACT scores, you'd rather have this conversion
23 than the one you're describing; and if that group is
24 distributed so that you have lower scores, then it may be
25 working out to their favor to be using this formula.

1 Q. So you're telling us that your model, for every single
2 Hawaii/Pacific Islander applicant for 2018 on the verbal
3 piece -- we'll get to the math piece in a moment -- deducted 24
4 points from their score. When they took the test -- the score
5 is not missing -- and they got exactly the same score as the
6 white applicant, that may be doing them a favor? Is that your
7 testimony?

8 A. The issue is the conversion of the scores, okay. So you
9 have something -- let's say we have a math score that -- an ACT
10 math, you get the top score, and you want to translate that to
11 a 1600 -- I'm sorry -- to an 800 on that SAT math. When we're
12 doing this regression, because there's noise in the model, that
13 translation is not going to work out one to one.

14 And what that means is that these scores are going to get
15 translated differently on these different components in ways
16 that are going to end up favoring some scores and disfavoring
17 others. It's not clear that this is working out to their
18 detriment. It's possible, but it's not clear.

19 Q. Sir, what is the noise in the system when two people take
20 the same test, answer the same questions right, the same
21 questions wrong, get the exact same, identical score, and now
22 you're telling one person, "Because of your race, I'm marking
23 things down. I'm giving a penalty for being African American
24 when you take the test and not being white"?

25 A. That's not where the noise in the system is. The noise in

1 the system comes about because when you have somebody who takes
2 an SAT and somebody who takes an ACT, those are the -- they had
3 to take both, and then we're regressing these two outcomes on
4 each other.

5 If it was the case that there was a perfect match between
6 ACT and SAT, there would be no noise in the system, and all
7 those coefficients would come out as zero. That's the point.
8 So the noise in the system leads to regression to the mean, and
9 that regression to the mean favors some applicants and will
10 hurt other applicants.

11 Q. Sir, we're talking about people getting identical scores,
12 and if you get an identical score --

13 A. I'm saying that what you do with those identical scores,
14 according to the concordance table versus this method, it is
15 not clear what -- who it's going to favor or disfavor.

16 Q. Sir, isn't it clear that if you're a Hawaii/Pacific
17 Islander, you do not want to have your scores concorded by a
18 racial deduction of 24 points on the verbal side?

19 A. It depends on what you got on the ACT score. It could be
20 that you end up getting a higher score through this method than
21 if you did the concordance table.

22 Q. And if you are white, you would be a lot better off if you
23 had the extra 25 points, correct?

24 A. Again, it depends on which -- your score on the ACT. It
25 will depend on that score.

1 Q. Let me ask it differently.

2 A. So here's the comparison I'm drawing: Would you do better
3 under the concordance table or under my method? And what I'm
4 saying is it all depends on the score. And how those scores
5 are distributed differently across race matters for that
6 because it can be that, yes, on average, that coefficient is
7 negative. But if that group is -- has test scores that are
8 distributed more, say, toward the -- below the mean, then
9 because we're doing this regression, that's actually helping
10 them. So those things are balancing out in the end.

11 Q. Sir, I'm talking about an individual -- let me ask it this
12 way.

13 A. I understand you're talking about an individual.

14 **THE COURT:** Just a minute. We're not going to talk at
15 the same time. Let him ask his question, and then you answer
16 it.

17 Ask your question.

18 **MR. FITZGERALD:** Thank you, Your Honor.

19 Q. (By Mr. Fitzgerald) Pursuant to your model, if you scored
20 a 32 ACT, would you better -- would you be better off being
21 black or white?

22 A. According to this, you would be better off being white,
23 subject to the caveat that it's still not clear that you would
24 do -- for both applicants whether you do better according to
25 the concordance table or using this regression.

1 Q. In a comparative analysis of black scores versus white
2 scores, your model favors whites and punishes blacks in
3 converting the scores, correct?

4 A. See, that's where I disagree, and that's because of the
5 regression to the mean that's present in the model. This score
6 is going to on average predict those relationships correctly.
7 That's why the -- that's what the regression does. It doesn't
8 mean that I'm going to be misforecasting black SAT scores on
9 average or misforecasting white SAT scores. It's going to have
10 effectively the same mean as if you did your concordance. So I
11 don't view it in that -- in that light.

12 Q. Let me ask you this: If your model correctly concorded an
13 ACT score into an SAT score for a white applicant -- make that
14 assumption, correct?

15 A. I don't know how to -- how to make that assumption. It's
16 in the context of the model. There is regression to the mean,
17 so we're not going -- it means things are going to be truncated
18 here. It doesn't work out that way. It's not a one-to-one
19 mapping in the way you're describing.

20 Q. In a one-to-one mapping, when a minority scores exactly the
21 same on a test as a white applicant, you're telling us that the
22 minority is not penalized when minus 8.1 points are deducted
23 from their verbal score?

24 A. I'm telling you that what I am doing here is a different
25 way than the concordance table that will produce the same mean

1 results across the different races.

2 Q. It will --

3 A. So that means that the method that I'm using is no more
4 racially biased than the concordance table from that
5 perspective.

6 Q. Is it your testimony that a concordance table that treats
7 people equally by race is no different -- is no less -- no more
8 advantageous than your model which takes points off for being
9 black, Hispanic --

10 A. Because of the regression to the mean, yes.

11 Q. There's no regression to a mean about --

12 A. Yes, it is, because when I -- okay. I think we need to
13 take a step back to say what I'm doing here.

14 What I'm doing here is I'm taking your SAT verbal score,
15 and I'm regressing it on your ACT score, okay. There's going
16 to be a coefficient that's on that SAT score -- on that ACT
17 score. That coefficient is going to be smaller than the
18 coefficient you're going to get from that concordance table,
19 and that's the regression to the mean.

20 Q. So, sir, let's put aside the merits of doing your own
21 concordance by regression or adopting the one that the
22 admissions officers actually use.

23 Let me start here. Let me go through these numbers. The
24 number deducted for a black applicant who went through was
25 minus 8.1, correct --

1 A. Correct.

2 Q. -- for SAT verbal?

3 For an Hispanic applicant for the same ACT score, the
4 deduction is minus 3.36, correct?

5 A. That's correct.

6 Q. For an Asian American applicant on SAT verbal, the
7 deduction is minus 1.4, correct?

8 A. That's correct.

9 Q. For the Hawaii/Pacific Islander, the deduction is minus
10 24.15, correct?

11 A. Correct.

12 Q. And, sir, I'm going to turn now to the math scores at
13 page 87, 88. And there we see the deduction for the identical
14 ACT score being converted to an SAT score for black is minus
15 13.5, correct?

16 A. Correct.

17 Q. For Hispanic is minus 7.77, correct?

18 A. Correct.

19 Q. And for Asian, it's a plus 10.83, correct?

20 A. Correct.

21 Q. For American Indian, it's a minus 2.1, correct?

22 A. Correct.

23 Q. For Hawaii/Pacific Islander, it's minus 25.6 for the SAT
24 math, correct?

25 A. Correct.

1 Q. Now, obviously -- to put the two together and figure out
2 the net change, will you agree with me that if you take from
3 the first chart of the deduction for SAT verbal where blacks
4 received a penalty of minus 8.1 and then if we look to the
5 bottom slide where the SAT math penalty is minus 13.5, that
6 totals about 22 points, correct?

7 A. Correct.

8 Q. And then if we look at the Hispanic entries, the penalty
9 for the SAT verbal is minus 3.36 and the penalty for Hispanics
10 on the math score is minus 7.7. So that totals approximately
11 minus 11, correct?

12 A. Correct.

13 Q. And then if we look at the Asian American applicants, we
14 see that they received a penalty over the SAT verbal of about
15 minus 1.4, but a bump on the SAT math of about 10.8, correct?

16 A. Correct.

17 Q. So that totals out to 9.

18 If we look at Native American, do we see an SAT verbal
19 penalty of minus 5.6 and then an SAT penalty for math of minus
20 2.1? Does that come out to approximately minus 8? Correct?

21 A. Correct.

22 Q. And then if we get to Hawaii/Pacific Islander, we have a
23 verbal penalty of minus 24 and change, correct?

24 A. Correct.

25 Q. And a math penalty of 25.6 negative, correct?

1 A. Correct.

2 Q. And that adds up to approximately a minus 50 for being
3 Hawaii/Pacific Islander versus being white for the same score
4 on the same test, correct?

5 A. Correct.

6 Q. In addition, your model also takes into account gender,
7 correct?

8 A. Correct.

9 Q. And the penalty for being female on the SAT verbal for
10 getting the exact same score is minus 9.5, correct?

11 A. The coefficient is minus 9.5, correct.

12 Q. And the penalty for being female on the SAT math component
13 is minus 13.97, correct?

14 A. The coefficient is minus 13.97, correct.

15 Q. You don't like saying "penalty"?

16 A. I don't because, again, I don't think that this process
17 penalizes them as a group because of the way the regression
18 works. And that's shown because I use her measures and I get
19 the same answers. So if I was doing this in this biased way,
20 why would I get the same answer when I use her scores?

21 Q. Sir, I'm just going to go through and make sure we
22 understand each other correctly. If an applicant were a black
23 female, under your model she would receive a penalty for being
24 black of 22 points on the SAT and a penalty -- slightly larger
25 penalty of 23.6 for being female, so a total penalty of about

1 45 points, correct?

2 A. I don't view it as a penalty, but that is what you get when
3 you add those coefficients.

4 Q. And are you aware that in the course of your process over
5 the six years that the folks who only had ACT scores numbered
6 more than 50,000?

7 A. I'm not sure.

8 Q. Are you aware that for the year 2018, you converted ACT
9 scores, SAT scores for about 42 percent of the African American
10 applicants?

11 A. I was not aware of that. I don't know whether that's the
12 case.

13 Q. Are you aware that you converted to an SAT score for about
14 45 percent of the Hispanic applicants?

15 A. No, I'm not aware of that. That -- I don't -- yeah, I
16 don't think that -- I don't have any evidence of that on either
17 account.

18 Q. Would you agree with me that these racial penalties applied
19 when converting ACT scores to SAT scores were not plain on the
20 face of your reports and charts that were introduced today?

21 A. One, it's not a penalty; and, two, it is true I didn't show
22 the slide that showed her way of doing the test makes no
23 difference to the model.

24 Q. And, sir, so you're telling me that if every African
25 American woman in the year 2018 who scored exactly the same as

1 a white male on the same test was given a score 45 points
2 lower, then you do not consider that a penalty?

3 A. Because that's not what's happening. That's what's --
4 you're -- you're missing the regression to the mean. If you
5 were correct, then when we use her test score methodology I
6 would get a different answer. I don't. So that is clearly a
7 mischaracterization of how the process works.

8 Q. Let me ask you this, sir, and let's see if this is a fair
9 characterization: A UNC admissions officer receiving a
10 concordance score for a white male applicant and a black female
11 applicant at the same time would receive the same score if the
12 people scored the same on the test, correct?

13 A. For the total SAT, correct.

14 Q. And in your model, it models an admissions officer looking
15 at a score that would be 45 points lower total for the SAT,
16 correct?

17 A. That's not the right comparison. Again, it's not the right
18 comparison because the way that the conversion is working here
19 is very different.

20 Q. They would receive -- your model would have the admissions
21 officer see a 45-point difference between the white male
22 applicant and the black female applicant for getting the same
23 score, correct?

24 A. No, no. There's much more to this story than that.

25 That's -- that's the point, is that what they're going to see

1 is they're going to see all the information. They're going to
2 see all the components of their ACT score. They're going --
3 there's just much more information. They don't see --
4 obviously, they don't see the 45-point difference. That's
5 clear. The issue is, is taking all the information that they
6 have, what is the appropriate score to put in there.

7 Q. Let me try this one more time. Let me just make sure we're
8 on the same page. Let's talk about the actual process at the
9 moment and put your model to the side.

10 Two people, one white male, one black female, exact same
11 score on the exact same test on the ACT. The UNC admissions
12 officer, looking at the two files side by side, would see an
13 identical score on the SAT, correct?

14 A. For the total SAT, correct. They would not have it
15 separately by verbal and math, which is the whole point.

16 Q. Then your model is going to take the same two people, a
17 white male and a black female who took the test on the same day
18 and gave the same answers; and for those two applicants, your
19 model has the admissions officers looking at component scores,
20 math and verbal, but there will be a difference between the
21 white male applicant who will have a higher score than the
22 black female applicant, correct?

23 A. I think -- according to those regressions, correct.

24 Q. Thank you.

25 Now I'm going to change topics to the transformation

1 examples. You would agree with me that your transformation
2 examples are created by basically changing the data entry in
3 your preferred model by either indicating a box that indicates
4 that you're white from a 1 to a zero, or vice versa, and then
5 the box for another race from a 1 to a zero or the other way
6 around, correct?

7 A. Yeah, we're turning off or turning on particular
8 coefficients.

9 Q. And these examples are entirely hypothetical, correct?

10 A. They're going to span -- we can do it for whatever
11 percentile. So while they're hypothetical, you can do it for
12 any percentile you want, which will cover -- could cover the
13 full application set.

14 Q. Is the answer to my question yes?

15 A. It's a hypothetical example, but not an irrelevant one.

16 Q. I just asked if it was hypothetical.

17 A. Okay. Correct.

18 Q. And to be clear, when you created these transformation
19 examples, you used the model -- the preferred model, correct?

20 A. Correct.

21 Q. The preferred model that included these coefficients or
22 penalties -- we'll agree to disagree -- included those
23 adjustments in converting the ACT scores to SAT, correct?

24 A. That makes no difference, but correct.

25 Q. And when you talked about the transformation examples --

1 A. And to be clear, that would only hold -- what you're
2 talking about would only hold for people who were missing those
3 scores. If you're not missing those scores, you're getting
4 those SAT math and verbal scores that they actually took --
5 when they took the SAT.

6 Q. Okay. The hypothetical we were talking about was when
7 people took the ACT and had to have it converted, correct?

8 A. I'm sorry. I must have missed that part of that
9 hypothetical. I thought you were just saying we are doing a
10 hypothetical --

11 Q. Oh, within this. Okay. Fair enough.

12 Now, sir, the assumptions you've made in your reports and
13 your testimony is that you would change race and leave
14 everything else unchanged, correct?

15 A. Correct.

16 Q. Just to be clear, that has never ever happened in the
17 empirical world, correct?

18 A. So, obviously, people do not change their race, but this is
19 a standard practice in the empirical world for economics. This
20 is how we measure these preferences.

21 Q. I meant in the real world. In the real world, no one has
22 ever changed their race, correct?

23 A. There's been a few examples of people who have tried, but
24 generally, no, they do not change their race.

25 Q. And your model assumes that if you take one of these

1 hypothetical applicants and you flip the switch so that their
2 race changes, everything else remains unchanged, correct?

3 A. What I am assuming is that my model -- that the
4 coefficients on race reflects the preference given to that
5 race. So I am operating more in a color-blind world where I
6 have accounted for all the other observed differences across
7 those races, and this is -- I'm interpreting that coefficient
8 as the preference given to that group. So those coefficients
9 represent the preferences for the group.

10 Q. Is the answer to my question yes, that you're assuming
11 everything else is unchanged?

12 A. When you say changing race, that's not what's going on.
13 This is what -- through my lens, this is changing racial
14 preferences. That's what's happening with these examples.

15 Q. So in one of these hypothetical examples where someone is
16 treated in the model as if they are black and then you flip the
17 switch to say now they're white, you're assuming that their
18 background, where they grew up, where they lived, where they
19 went to school, what access to programs they had, what kind of
20 mentors they had, what kind of internship opportunities they
21 had -- that their life in this model would be entirely
22 unchanged by growing up from 0 to 18 with their race changed?

23 A. No, because that's why we have all those controls, to try
24 to capture those things.

25 Q. If you treat someone as a black person instead of a white

1 person 18 years into their life, do you think there's an
2 adjustment for how different they would be treated?

3 A. Well, of course. The experiences of African Americans are
4 different from the experiences of white Americans and of other
5 groups. There's no question about that. The question is have
6 I adequately captured the differences in terms of the
7 observables between those groups and then what is left over.
8 And when you continue to add controls, those race coefficients
9 always go up. There's no evidence -- now, it may be that UNC
10 should value things differently, but there's no evidence that
11 this thing is not a preference.

12 Q. And your -- your theory about these transformation examples
13 is premised on the idea that correlation equals causation,
14 correct?

15 A. My theory is that using -- I -- I'm not sure how to
16 interpret that. You know, I'm capturing the admissions
17 process. It accurately predicts, you know, over 90 percent of
18 the time. I don't feel like I -- you know -- yes. I'm sorry.
19 Say the question again. Obviously, correlation does not imply
20 causation.

21 **MR. FITZGERALD:** Can I have one moment, Your Honor?

22 **THE COURT:** Yes.

23 (Pause in the proceedings.)

24 **MR. FITZGERALD:** Your Honor, I would just ask for a
25 pause. I believe it was mentioned to Ms. Blay and to counsel

1 we wanted to discuss a couple of applicant files. Because
2 they're confidential, we would just ask that the audio be
3 turned off upstairs and that no one in the courtroom be here
4 other than counsel. And if I forgot to raise that with
5 Your Honor after the lunch break, that's -- I apologize.

6 **THE COURT:** All right. If there are others in the
7 courtroom, other than counsel, I am going to have to ask you to
8 leave at this time.

9 (Spectators left the courtroom and audio privacy settings
10 were turned on.)

11 **THE COURT:** Do we have any idea how long this
12 discussion is going to last?

13 **MR. FITZGERALD:** I would guess, Your Honor, 20 minutes
14 or less.

15 **THE COURT:** All right.

16 **MR. FITZGERALD:** And, Your Honor, just to be
17 transparent, when I'm done with that section, I'll confer with
18 my cocounsel, but I likely will be done in terms of Your Honor
19 planning the afternoon.

20 **THE COURT:** All right.

21 **MR. MCCARTHY:** Your Honor.

22 **THE COURT:** Yes, sir.

23 **MR. MCCARTHY:** I'm sorry. Just to clarify, are the IT
24 people that are part of the teams okay to stay in here?

25 **THE COURT:** Yes.

1 **MR. MCCARTHY:** Thank you.

2 **THE COURT:** All right. You may proceed.

3 **MR. FITZGERALD:** Thank you.

4 (Sealed portion of trial testimony occurred next and
5 appears under separate cover.)

6 **MR. FITZGERALD:** I have nothing further, Your Honor.

7 **THE COURT:** All right.

8 **MR HINOJOSA:** Your Honor, I have a few questions.

9 **THE COURT:** You have question?

10 **MR HINOJOSA:** A few questions, correct.

11 **THE COURT:** All right. Go ahead.

12 **CROSS-EXAMINATION**

13 **BY MR. HINOJOSA:**

14 Q. Do you see me okay, Professor Arcidiacono?

15 A. I can.

16 **THE CLERK:** Judge, we're still on mute, right?

17 **THE COURT:** Oh, we should bring them back.

18 **THE CLERK:** Is that it?

19 **MR. FITZGERALD:** Yes, I will not be referring to the
20 file anymore.

21 **THE COURT:** Right. And we can unmute them, yes.

22 (Spectators returned to the courtroom and audio privacy
23 settings were turned off.)

24 **THE COURT:** You may proceed.

25 **MR HINOJOSA:** Thank you, Your Honor.

1 Q. (By Mr. Hinojosa) Professor Arcidiacono, I just want to
2 clarify a few things about your decile analysis.

3 A. Sure.

4 Q. In your descriptive analysis when analyzing UNC admission
5 rates by race by decile, you found that there were some white
6 students in the lower five deciles who were admitted both in
7 state and out of state, correct?

8 A. That's correct.

9 Q. And, in fact, in the lower five deciles, there were several
10 hundred, over 2,000 if my math was correct, of white students
11 admitted both in state and out of state. Does that sound
12 correct?

13 A. I would have to look at the numbers, but I'll trust your
14 math for the moment.

15 Q. I can certainly show you if you would like to see.

16 A. Sure.

17 Q. I can show you the numbers. So this is page 11 of 117.11
18 that was shown earlier. .1? Or 117.1.

19 A. Can you just scroll up so I can see where the -- this is in
20 state. Okay.

21 Q. In state. And you see in the fifth decile for whites you
22 had 3,880; for the fourth decile, 3,663; third decile, 3,310;
23 second decile, 2,762; and the first decile, 1,848. Do you see
24 that?

25 A. I do.

1 Q. I'm not going to ask you about the math in all of them. I
2 think we'll get to 2,000 with just a few here.

3 And going over to your in-state admission rates by academic
4 decile, which is page 13 of the same demonstrative exhibit --

5 A. Yeah.

6 Q. -- you have 29.56. So that was 29.56 of 3,880, which is
7 1,146. Does that sound right?

8 A. Yeah. My math isn't so great on the stand, but that sounds
9 right.

10 Q. And then 17.8 of 3,663 in the fourth decile, that's 653?
11 Does that sound correct?

12 A. I suppose.

13 Q. Well, I think the record will be able to reflect that, and
14 certainly counsel can correct you on redirect if they want.

15 And then the third decile, which was 3,310, it was
16 7.76 percent that are admitted, which comes out to 256. Do you
17 have any reason to disagree with that?

18 A. No.

19 Q. And at the same time that there were white students who
20 were admitted in the lower five academic deciles, as you've
21 described here -- and I certainly understand, you know, the
22 Defendants take issue with some of those, perhaps.

23 But at the same time, you also -- both for in-state and
24 out-of-state black and Hispanic students who you have rated in
25 the top five deciles, there were several of those Hispanic and

1 black students who were rejected or denied their application to
2 UNC, correct?

3 A. That's correct.

4 **MR. HINOJOSA:** No further questions, Your Honor.

5 **THE COURT:** All right.

6 Yes, sir.

7 **MR. MCCARTHY:** Your Honor, this seems like a good time
8 to take the afternoon break, and we can convene with counsel to
9 look at the program that they offered and we all agreed that
10 Professor Arcidiacono could look at. That would help us
11 determine whether we need to redirect on those issues.

12 **THE COURT:** All right. Then let's take a 15-minute
13 recess.

14 Will that be sufficient time?

15 **MR. MCCARTHY:** I should ask Professor Arcidiacono. I
16 don't know how long it will take him to look up -- pull it up
17 and him be able to look at it sufficiently because it is, I
18 think, a massive data file.

19 **THE COURT:** All right. Let's take a recess, and my
20 people will let me know when you are ready to proceed.

21 **MR. FITZGERALD:** Thank you, Your Honor.

22 **THE COURT:** All right.

23 **THE WITNESS:** Can I just get one clarification? Maybe
24 my lawyer knows the answer. But what am I allowed to talk with
25 them about? Am I allowed to talk with them about this right

1 now?

2 **THE COURT:** Are you allowed to talk with your
3 attorneys?

4 **THE WITNESS:** Yeah.

5 **THE COURT:** You may.

6 **THE WITNESS:** Okay.

7 **MR. MCCARTHY:** We're going to look together at the
8 file data.

9 **THE WITNESS:** Thank you.

10 **THE COURT:** All right.

11 **MR. MCCARTHY:** And, Your Honor, one thing.

12 **THE COURT:** Yes.

13 **MR. MCCARTHY:** In case it wasn't clear before,
14 Professor Arcidiacono is the only witness on the schedule for
15 today. The parties -- when we scheduled out before, the next
16 witness was planned to be Mr. Kahlenberg, and he's scheduled
17 for Thursday morning. So his arrangements were made around
18 that, and the parties have not disclosed demonstratives and
19 things like that because we were planning to do that on our
20 side late today for him on Thursday and their side late
21 tomorrow for Thursday. So we have no further witnesses planned
22 for today.

23 **THE COURT:** All right. We'll address that when we
24 resume.

25 **MR. MCCARTHY:** Okay. Thank you.

1 (An afternoon break was taken from 2:35 p.m. until
2 3:05 p.m.; all parties present.)

3 **THE COURT:** All right. Where are we, gentlemen?

4 **MR. MCCARTHY:** Sorry, Your Honor. We would like to do
5 a little bit of redirect.

6 **THE COURT:** All right.

7 **MR. MCCARTHY:** It will be short.

8 **THE COURT:** That's fine.

9 **REDIRECT EXAMINATION**

10 **BY MR. MCCARTHY:**

11 Q. Professor Arcidiacono, do you recall just a bit ago that
12 Mr. Fitzgerald asked you about some applicant files and showed
13 them to you, and you two read some back and forth to each
14 other?

15 A. I do.

16 Q. Did you want to explain whether that affects your
17 confidence in your model and its outputs?

18 A. I do. Obviously, the stories were very compelling. You
19 know, who wouldn't be moved by that. The issue of statistical
20 analysis is that you get to see the broad -- you know, all the
21 applications. There's no question that we miss certain things.

22 Why I'm skeptical about those being representative is
23 because of how first-generation college works in the process.
24 And you do see that you get a bump for first-generation
25 college, but the fact that that area -- if you're African

1 American, you get the big African American bump, but then you
2 don't get the first-generation college bump. That's what makes
3 me a little skeptical about the applicability of that to the
4 broader pool and to what's going on with my model.

5 Q. Did you prepare a slide that showed the effect of racial
6 preferences by first-generation college status?

7 A. I did.

8 **MR. LAWRENCE:** What number?

9 **MR. MCCARTHY:** Number 40.

10 Q. (By Mr. McCarthy) Could you tell us generally what's on
11 this slide?

12 A. So this goes to the marginal effects analysis, but this
13 time not only are we looking at race but breaking it out by
14 first generation/not first generation.

15 And so if you look in state, that first row is African
16 American not first-generation college. Again, the first column
17 is the status quo, so that's with racial preferences in place.
18 And there you can see the admit rate is 33.4 percent, and that
19 falls to 18.4 when you remove racial preferences. So the drop
20 is 14.9, which is the marginal effect of race.

21 When you go down one row, that shows it for
22 first-generation college, and there we're starting off with a
23 lower admit rate at 26.1 percent. When you remove racial
24 preferences, it goes down, but it goes down, you know,
25 substantially less than what's happening for

1 non-first-generation college. Because if you took away -- if
2 you turned off the racial preferences, you would no longer
3 get -- they would no longer get the African American bump.
4 Now, they would get the first-generation college bump, okay,
5 because we're taking away the racial preference part of
6 everything.

7 If you go down to the out of state, you can see the same --
8 the same thing. If you look at the differences in admit rates
9 under the status quo, it's 19.1 with racial preferences in
10 place, and then -- for non-first-generation college, but for
11 first-generation college, it's 11.9.

12 Now, obviously, the removal of racial preferences out of
13 state dramatically decreases African American representation,
14 regardless of whether they're first-generation college, but
15 because you don't get the full bump when you're
16 first-generation college, we end up with admit rates that are
17 actually fairly close there, the 1.6 and 1.4 percent. That
18 marginal effect of race is a bigger gap there.

19 Q. Thank you.

20 Do you remember Mr. Fitzgerald's questions about your
21 conversions?

22 A. I do.

23 Q. The ACT to SAT conversions for the applicants that did
24 not -- that only took the ACT?

25 A. I do.

1 Q. And you indicated, I believe, that you had one way of
2 converting these scores and Professor Hoxby had another way of
3 converting these scores; is that true?

4 A. That's correct. I break out the SAT score by math and
5 verbal, which means you have to have some way -- you can't use
6 the concordance table for that, and she uses just the total SAT
7 score.

8 Q. Just to make sure we understand, what is Professor Hoxby's
9 method for converting ACT scores to SAT scores for students
10 that only take the ACT?

11 A. It's what's called the concordance table. So this is --
12 will give you here is the score on the ACT and then here is
13 what it corresponds to on the SAT.

14 Q. And then what is your method for converting ACT scores to
15 SAT scores for students who took only the ACT?

16 A. I take the people who took both exams, and I estimate the
17 relationship between the SAT math score and the controls, and I
18 use those controls to then predict what their SAT math score
19 would have been. And that's where sometimes we do see negative
20 coefficients there, but because of, you know, how this
21 prediction process works, on average the test scores are not
22 going to look all that different across races between my method
23 and her method.

24 Q. And, in fact, does Professor Hoxby's method of conversion
25 result in higher or lower converted scores than your method?

1 A. It's hard to tell, you know.

2 Q. Do they have the same meaning?

3 A. Well, actually, I don't know whether they have the same
4 meaning, but that's my suspicion, is that they do. I mean, I'd
5 have to look through it to see.

6 Q. So in some cases, would Professor Hoxby's conversion be
7 lower than yours and others be higher than yours?

8 A. That's right. It would depend on the score on the test for
9 sure.

10 Q. But in some cases --

11 A. And when I say same mean, I mean by race.

12 Q. Yes.

13 A. It's got to have the same mean by race for these things.

14 Q. So for some applicants, Professor Hoxby's converted score
15 would be lower than yours; and for some others, her converted
16 score would be higher than yours?

17 A. Right.

18 Q. And now, I believe when you were speaking with
19 Mr. Fitzgerald, you explained that you ran it both ways in your
20 models, and it didn't change the results; is that correct?

21 A. That's correct.

22 Q. And did you -- is there a table in your rebuttal report
23 that shows this?

24 A. There is.

25 **MR. MCCARTHY:** Mr. Lawrence, can you go to 117? I

1 think it's page -- 117.2. I'm sorry. I think it's page 39.

2 Q. (By Mr. McCarthy) Is this the table,

3 Professor Arcidiacono?

4 A. That looks like the table, yes.

5 Q. Can you see it okay there?

6 A. Yes.

7 Q. Can you explain for us what's on that table?

8 A. Okay. So in the first column is what we've always been
9 working with, which is the status quo, and that doesn't depend
10 on whether I'm doing this prediction using my methods to
11 convert the ACT scores or Professor Hoxby's.

12 Q. Those are the status quo numbers we've seen several times?

13 A. Yes. And whatever method I use, my model is going to
14 predict those on the nose.

15 So then in the next column, those are -- oh, those are the
16 marginal effects of my preferred model.

17 Q. And we've seen those numbers today too, correct?

18 A. That's correct. So this is -- that 12.7 was the difference
19 between the average admission probability and the probability
20 without the racial preferences, okay. So higher numbers mean
21 larger estimated preferences.

22 Q. Okay. So now we have -- you have two columns to the right
23 of that. One says "Robustness (1)" and one says "Robustness
24 (2)." Can you tell me what those two different things are?

25 A. So what "Robustness (1)" does is it just takes Hoxby's

1 measures -- Professor Hoxby's measures of test scores, grades,
2 and class rank and, I guess, replace mine with hers.

3 Q. So it adopts her methodology?

4 A. Completely.

5 Q. Okay. And what do you get there in terms of the average
6 marginal effect of race?

7 A. It's slightly smaller. So instead of 12.7 percent for
8 in-state African Americans, it's 11.9. Out of state, it's 15.6
9 for African Americans in my preferred model, 14.9 for hers.

10 Now, there's a key other difference here. This is not
11 per se driven by those conversions that we were talking about
12 because my preferred model also has interactions between
13 missing GPA and grades, okay, whereas her model does not.

14 So in the second robustness column, I also interact the
15 times when it's missing. So if you're missing your class rank,
16 then we're going -- missing GPA, we're going to interact those
17 variables with race; and so what that does is that allows you
18 to have different values for those variables if you're missing
19 race. Those values we think are actually in the data, just not
20 in the data set, like they're able to see this sort of
21 information. And there the numbers are actually higher. So
22 now the marginal effect in that second column is 14.2 percent
23 for in-state African Americans, higher than the 12.7 in my
24 preferred model, and 16.4 percent for out of state compared to
25 15.6 in my preferred model.

1 Q. And the point here is that your results are robust to
2 alternative methods of translating these ACT to SAT scores?

3 A. That's right.

4 Q. I just want to make sure we look at something real quick
5 here. So if we look in the second column, that average
6 marginal effect of race, if we look, let's say, at out-of-state
7 African American, that 15.6 right there, that represents the
8 calculation you showed us before that was 17.1 with race to
9 1.5 percent without race, correct?

10 A. Correct.

11 Q. So when you remove racial preferences under your model, it
12 went from 17.1 to 1.5, correct?

13 A. Correct.

14 Q. And if we do the same thing with Professor Hoxby's version,
15 which is in the "Robustness (1)" column, right, it drops from
16 17.1 all the way down to 2.2, correct?

17 A. Correct.

18 Q. And that's why we have 14.9 is the marginal effect of race,
19 correct?

20 A. Correct.

21 Q. So what does that tell you about the size of those racial
22 preferences whether you use your method for translating those
23 scores or Professor Hoxby's method for translating those
24 scores?

25 A. They're going to be very large regardless.

1 Q. Thank you.

2 MR. MCCARTHY: Nothing further, Your Honor.

3 THE COURT: Anything further?

4 MR. FITZGERALD: Nothing further, Your Honor.

5 THE COURT: All right. Anything further?

6 MR. HINOJOSA: No, Your Honor. Thank you.

7 THE COURT: All right. Now, you've indicated that you
8 don't have your next witness present.

9 You may step down. Thank you.

10 THE WITNESS: Thank you.

11 (The witness left the stand.)

12 MR. STRAWBRIDGE: Yes, Your Honor. And I apologize.

13 We actually meant to bring this to the Court's attention
14 earlier in the day. But because we have a protocol for
15 exchanging demonstratives, as well as exhibits to be used, and
16 it was predicated on the initial schedule, we're running far
17 enough ahead now -- and, of course, we have a holiday
18 tomorrow -- we haven't done those exchanges. And counsel and I
19 had discussed, I think on Monday maybe -- I can't remember what
20 day it was. We discussed the possibility that if we finished
21 with Professor Arcidiacono early we would both plan on starting
22 the next witnesses on Thursday.

23 I apologize for not -- we meant to discuss that with the
24 Court this morning, so I do apologize. We're trying to be
25 flexible, and it turns out that the parties have been a little

1 bit more efficient with the witnesses than they anticipated
2 being so far.

3 **THE COURT:** Now, let me ask this question: On one
4 part of the protocol, we have an additional witness, this
5 Yolanda Coleman, but she is not on the list that gives the
6 estimated times. Are we expecting her to be a witness?

7 **MR. STRAWBRIDGE:** No, Your Honor. We withdrew her as
8 a witness, and we did deposition designations for her.

9 **THE COURT:** Oh, I see. All right.

10 So you have one witness left; is that correct?

11 **MR. STRAWBRIDGE:** That is correct, Your Honor, and we
12 do expect that we will be able to finish him -- we'll start him
13 first thing Thursday morning, and we'll be finished with him
14 before the end of the day on Thursday, and I think UNC is
15 prepared to start Mr. Farmer that day as well.

16 **THE COURT:** All right.

17 **MR. STRAWBRIDGE:** And we've -- I'll just -- I'm sorry,
18 Your Honor.

19 **THE COURT:** Yes. No, go ahead.

20 **MR. STRAWBRIDGE:** We've just had some discussions. I
21 think we'll continue to discuss to see if we can agree between
22 us to potentially adjust the schedule so that -- I don't want
23 to waste any time the Court has set aside for trial, so we're
24 respectful of that. If we can maybe adjust the schedule, if
25 Your Honor would like, to try to move things up, we can

1 certainly try to do so by working it out amongst ourselves.

2 **THE COURT:** I would appreciate it. The more efficient
3 we can be, the better off everybody is. So I would appreciate
4 you going through that exercise to see if we can't do that.

5 **MR. STRAWBRIDGE:** We'll do our best. And we know that
6 their witnesses have also made travel arrangements, so we'll
7 try to do the best we can.

8 **THE COURT:** All right. Since it appears that their
9 case may end on Thursday, are we going to be -- should I have
10 in writing with respect to that matter that they have requested
11 reconsideration on?

12 **MR. FITZGERALD:** Yes, Your Honor. And I would ask the
13 Court's indulgence because there's two aspects of this we have
14 to deal with. One is the legal aspect of going through and
15 making sure we have everything accurate. Secondly, to be
16 candid, we need to prep with people who know economics better
17 than we do and figure out what everything means.

18 So what I would like to do is -- the people who are
19 briefing it are preparing the witnesses for Thursday, and I'm
20 prepping -- and Friday for our case. I'll be handling a
21 witness on Thursday. Could we have until the weekend, Your
22 Honor, since the proffer is already in the record?

23 **THE COURT:** I will then give you until Monday morning
24 to provide that to me.

25 **MR. FITZGERALD:** Perfect. Thank you, Judge.

1 **THE COURT:** All right. Is there anything further we
2 need to address today?

3 **MR. FITZGERALD:** One item, Judge.

4 **THE COURT:** Yes.

5 **MR. FITZGERALD:** And it's just for the record. We
6 excused people while we read an applicant file, and I just
7 would ask that the Court designate that part of the transcript
8 confidential.

9 **THE COURT:** Designate it what now?

10 **MR. FITZGERALD:** Under seal. Sorry.

11 **THE COURT:** Oh, under -- I will so designate that
12 portion where we excused individuals as under seal.

13 **MR. FITZGERALD:** Thank you.

14 **MR. STRAWBRIDGE:** Your Honor, is there any
15 opportunity -- if they're going to have until the weekend,
16 could we be given 24 hours for a three-page-or-less reply
17 brief? You knew lawyers have to take a mile.

18 **THE COURT:** Well, I honestly don't think this issue is
19 going to require a reply brief.

20 **MR. STRAWBRIDGE:** Fair enough.

21 **THE COURT:** I think you have adequately -- and now we
22 even have the information that he would offer.

23 So I just ask for your brief, and that should be sufficient
24 for us to make a resolution of this.

25 **MR. STRAWBRIDGE:** Understood, Your Honor. Thank you.

1 **THE COURT:** All right. Anything further?

2 **MR. FITZGERALD:** No, Your Honor.

3 **THE COURT:** All right. Let us adjourn court.

4 (Proceedings recessed at 3:19 p.m.)

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8 **C E R T I F I C A T E**

9 I, LORI RUSSELL, RMR, CRR, United States District Court
10 Reporter for the Middle District of North Carolina, DO HEREBY
11 CERTIFY:

12 That the foregoing is a true and correct transcript of the
13 proceedings had in the within-entitled action; that I reported
14 the same in stenotype to the best of my ability and thereafter
15 reduced same to typewriting through the use of Computer-Aided
16 Transcription.

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16 Lori Russell, RMR, CRR
17 Official Court Reporter

 Date: 12/11/2020